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MILBURN (MARGARET) & GRAVATT (G. F.). **Preliminary note on a Phytophthora root disease of Chestnut.**—*Phytopath.*, xxii, 12, pp. 977–978, 1932.

A species of *Phytophthora* apparently identical with *P. cambivora* [*R.A.M.*, xi, p. 737; xii, p. 334] has been isolated from the blackened roots of dying American chestnuts (*Castanea dentata*) from Georgia, South Carolina, and Tennessee. The oospore stage of the fungus has not yet been observed in nature. The organism was isolated and used to inoculate greenhouse seedlings of *C. dentata* and *C. sativa*, killing 72 per cent. of the former and 74 per cent. of the latter in four months. The native *C. pumila* is also susceptible and the Japanese *C. crenata* and Chinese *C. mollissima* slightly so. So far no inoculations on the Chinese *C. henryi* and *C. seguinii* have succeeded. Two out of 81 inoculated seedlings of *Quercus prinus* became infected.

There is reason to suppose that *P. cambivora* has been present in the United States for many years, and that it is an important (possibly a primary) cause of the dying-off and recession of the chestnut at the lower altitudes in various localities from Maryland to Mississippi.

Considerable variation was observed in the symptoms caused by the fungus, some large trees wilting suddenly while others died gradually over a period of two years or more from the top downwards. The tap-roots were mostly more severely affected than the lateral ones, frequently exuding an inky slime. In some cases the roots were blackened only at their juncture with the crown, and on other trees isolated cankers were formed.

GOIDÁNICH (G.). **La verticilliosi dèll' 'Acer campestre' L. e alcuni altri casi di tracheomicosi in Italia.** [Verticilliosis of *Acer campestre* L. and some other cases of tracheomycosis in Italy.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 3, pp. 285–297, 7 figs., 1932.

In August 1932 some four hundred two- to ten-year old *Acer campestre* trees growing under ideal conditions near Bologna

suddenly developed a serious wilt (verticilliosis), the same symptoms in a milder form later being observed on the same host over an extensive area in the vicinity. The affected trees withered and became prematurely defoliated. Sections of affected and apparently unaffected branches showed a chestnut to dark green or black discoloration in the xylem, with mycelium in the vessels; the bark was not loose and there was no exudate. A *Verticillium* with dark micro-sclerotia [*R.A.M.*, x, p. 757] was isolated from diseased material. Subsequently a similar species was isolated from *A. platanoides* showing a dark green discoloration of the wood [cf. ibid., viii, p. 424].

Brief notes are given on tracheoverticilliosis (from which species of *Verticillium* were isolated) on the following new hosts: *Chimonanthus fragrans*, *Euphorbia* sp., *Koelreuteria paniculata*, and *Lonicera biflora*. *Verticillium* tracheomycosis was also observed on *Fatsia japonica* [ibid., x, p. 149], *Papaver rhoeas* [ibid., iv, p. 495], phlox (*Phlox* (?) *pyramidalis*), and apricot [ibid., x, p. 150]. An extensive wilt of watermelons was due to *Fusarium niveum* [ibid., xii, p. 197].

MILLER (P. W.). **Third report of progress of studies on Walnut blight and its control in Oregon.**—*Twenty-fourth Ann. Rept. Oregon State Hort. Soc.*, pp. 140–161, 1932.

Recent studies on walnut blight (*Bacterium juglandis*) [*R.A.M.*, xii, p. 253] in Oregon [ibid., vii, p. 176], where the loss of nuts from it reached 50 to 65 per cent. in certain localities in 1932, and an average loss for the State of 8 per cent. is estimated to have occurred even though the season was not a bad one for the disease, have shown (1) that the pathogen overwinters under local conditions primarily in diseased buds and in infections on the twigs; (2) that rain-water is the chief agent in the spread of primary and secondary infections; and (3) that the timely use of 3–3–50 Bordeaux mixture is an effective means of control. Rain during and shortly after the period of blooming is the chief factor in causing the initial attacks, which were observed from about the middle of May in 1932, the main damage occurring between 8th June and 6th July. No new infections were found after 12th September, and inoculations after 15th July failed. The best results were obtained by spraying (1) just before blooming of the pistillate flowers, and (2) immediately after blooming, when the stigmas of the pistils are turning brown. In cases of severe epidemics a third treatment about a fortnight after the second application is necessary to control blight. Dusting has so far not given sufficiently good results to recommend its use. Injury to nut-setting followed spraying with Bordeaux when the pistillate flowers were fully open to receive pollen. Growers appear generally to have profited by the increased yield and superior quality of the nuts due to Bordeaux treatment, which further reduced the number of hold-over infections.

VOGLINO (P.). **Le macchie nere del Noce.** [Black spots of Walnut.]—*La Difesa delle Piante*, ix, 6, pp. 85–86, 1932.

In the autumn of 1932 walnuts in the vicinity of Susa, Italy,

showed black spots near the veins on the young leaves, which spread until the whole leaf was involved, and also on the young branches, on which, however, they remained localized. The small fruits developed similar black spots, which eventually covered a large part of the surface, penetrating to the endocarp and causing premature dropping. The attack was favoured by rainy weather, and was most prevalent in low-lying, damp situations.

From the symptoms produced the author considers that the trees were infected by the well-known bacterial blight of other countries (*Pseudomonas* [*Bacterium*] *juglandis*) [see preceding abstract] especially as a bacterium was found in the necrosed tissues.

ALBEN (A. O.), COLE (J. R.), & LEWIS (R. D.). **New developments in treating Pecan rosette with chemicals.**—*Phytopath.*, xxii, 12, pp. 979–981, 1932.

Continuing their experiments in the control of pecan [*Carya pecan*] rosette in Louisiana by the injection of iron salts into the trees [*R.A.M.*, xi, p. 684], the writers found that the iron used contained appreciable quantities of zinc. In a test to compare the effects of zinc sulphate and zinc chloride solutions with those of iron sulphate, the new leaves of diseased trees were restored to their normal condition by dipping the terminal twigs in (or spraying the trees with) zinc sulphate or zinc chloride, while no improvement resulted from iron without zinc. The results are evidently similar to those of Chandler and his collaborators in the control of little leaf or rosette in fruit trees [in California: ibid., xii, p. 99]. The application of 2–2–50 zinc-lime [ibid., xi, p. 660] also benefited the trees, though to a smaller extent than zinc sulphate. The best results were obtained by the use of 0·18 per cent. zinc sulphate or 0·012 per cent. zinc chloride; the latter showed a marked tendency to burn the foliage when applied at higher concentrations.

FILIPPOFF (G. S.). Материалы по микофлоре слизетечений древесных пород. **1. Dissophora nadsonii nov. sp.** [Contributions to the mycoflora of slime flux of trees. 1. *Dissophora nadsonii* nov. sp.]—*Bull. Acad. des Sciences de l'URSS*, Leningrad, Ser. VII, viii, pp. 1155–1162, 1 pl., 3 figs., 1 diag., 1932.

This is a morphological, cultural, and taxonomic account of a species of Mucoraceae that was isolated in 1931 from a slime flux of cork oak (*Quercus suber*) in Soukhoum [Caucasian littoral of the Black Sea]. On beer wort agar the organism formed colonies of the type of *Mucor ramannianus* [*R.A.M.*, ix, p. 676]; the growth was most rapid and the colouring of the mycelium was most intense at 25° C., while at 7° to 10° the growth was slowed down but in the end the colony was more luxuriant than at any of the other temperatures tested; at 36° the growth was very poor. In its morphological details it approached closest *Dissophora decumbens* Thaxt., and is described as a new species of this genus, *D. nadsonii*. When grown in mixed cultures with *M. mucedo* and *M. hiemalis* it gave indications of parasitizing these moulds.

BADAMI (B. S. R.) & IYENGAR (C. S. R.). **The bio-chemistry of the spike disease of Sandal (Santalum album, Linn.) I. Note on the influence of chlorine on starch accumulation in disease. II. The role of manganese in health and disease.** —*Mysore Sandal Spike Invest. Ctte, Bull.* 2, 12 pp., 2 graphs, 1932.

A comparative examination in 1928–9 of the chemical composition of healthy and spike-diseased sandal (*Santalum album*) leaves from various parts of Mysore indicated that the chloride content of the latter is practically uniform throughout the year and consistently lower than that of the former. A low chloride concentration, therefore, co-exists with an excess of starch and a relatively increased diastatic activity in a diseased leaf [*R.A.M.*, ix, p. 277].

That spike disease is not due to a lack of manganese was shown by the fact that affected leaves contain, bulk for bulk, more of this mineral than healthy ones. This excess of manganese was found to bear no relationship to the availability of the metal in the soil in which the plants were growing. The course of protein synthesis was little affected by the presence of excess manganese in the leaves.

KALANDRA (A.). **Příspěvek ke studiu škodlivosti Botrytis cinerea Pers. v lesních školkách a semeništích.** [Contribution to the study of the damage caused by *Botrytis cinerea* Pers. in tree nurseries and seed-beds.]—*Ochrana Rostlin*, xii, 5–6, pp. 130–134, 2 figs., 1932. [French summary.]

A very brief account is given of a blight of conifer seedlings caused by *Botrytis cinerea* which is stated to be of rather frequent occurrence in Czecho-Slovakian nurseries, especially in seed-beds of *Pinus sylvestris*. Outbreaks of the disease are severe in dense stands, and most of the first-year seedlings may be killed. The blight may be easily controlled, however, by avoiding thick sowing and by measures directed towards promoting the health of the seedlings, such as proper choice and adequate fertilization of the soil for the seed-beds.

MOUNCE (IRENE). **Microscopic characters of sporophores produced in culture as an aid in identifying wood-destroying fungi.**—*Trans. Roy. Soc. Canada*, 3rd Ser., xxv, Sect. v, pp. 177–181, 1 pl., 1932.

The macroscopic characters of the rots and cultural characters of the sporophores of wood-destroying fungi were found by Hubert to afford satisfactory evidence of identity [*R.A.M.*, iv, p. 386]. The author has now established that a study of the microscopic characters of the sporophores may also be of value. The methods used for the examination of the sporophores were similar to those described in detail by Overholts (*Proc. Internat. Congr. Plant Sci., 1926*, ii, p. 1688, 1929). In some cases the sporophores are in themselves diagnostic, but as a rule they are reduced to a hymenial layer lining a few pores or covering some tooth-like projections, with no trace of a pileus and its distinguishing characters.

Sporophores developing in cultures of fungi isolated from infected wood may show distinguishing characteristics in the

following features: (*a*) type of basidia; (*b*) colour, shape, surface characters, and approximate size of spores; (*c*) presence of hyphal pegs, conducting organs, vesicular bodies, setae or cystidia, and their colour, size, and encrustation; and the colour reaction of the context in potassium hydroxide solution. These characters, combined with the information available as to the host and nature of decay, may limit the number of organisms to be studied in comparative cultures. Monospore cultures may also be made, paired with others of known origin, and submitted to the clamp-connexion test for specific identity.

The colour and shape of spores produced in culture are typical and the size usually falls within the limits of the species, although this character may be somewhat variable. The presence of brown cystidia in the pores of a fruit body developing in culture has been reported by Baxter for *Polyporus hispidus* [ibid., v, p. 265], and the writer has found the hyphal pegs of *P. anceps* [ibid., ix, pp. 149, 628] on the hymenium. According to Overholts (loc. cit.) many of the thin *Polystictus* types of *Polyporus* possess hyphal pegs, which are further present in a few species of *Favolus*, e.g., *F. brasiliensis*, and in *Trametes serpens*. The occurrence of these organs is thus particularly valuable for diagnostic purposes.

LACHMUND (H. G.) & HANSBROUGH (J. R.). **Preliminary report on the relative susceptibility of Sugar Pine and Western White Pine to blister rust.**—*Journ. of Forestry*, xxx, 6, pp. 687–691, 1932.

An experiment to determine the relative susceptibility to blister rust (*Cronartium ribicola*) under natural conditions of sugar pine (*Pinus lambertiana*) and western white pine (*P. monticola*) [*R.A.M.*, xi, p. 276] was initiated in 1926 at Daisy Lake, British Columbia. Three test plots with a total of 114 seedlings of the former and 177 of the latter species were laid out and inspected periodically between 1928 and 1931. In order to facilitate and accelerate the infection of the trees, numerous cultivated and wild bushes of the alternate hosts, black currant, *Ribes sanguineum*, and *R. bracteosum*, were transplanted in close proximity to the test plants, near which a few bushes of *R. lacustre* were already growing [ibid., xi, p. 553].

At the beginning of the investigation, the size and number of needles of corresponding trees of the same species were practically identical, but this relationship gradually changed until the sugar pines bore some 15 per cent. fewer needles than the western white pines. At the end of 1931 there were rather more than twice as many cankers per tree on the sugar pines as on the western white pines, suggesting that the former is at least equally susceptible with the latter to *C. ribicola* and probably more so.

DAY (W. R.). **Defoliation of Larch as a cause of disease.**—*Forestry*, vi, 2, pp. 113–124, 1 pl., 1 graph, 1932.

Continued studies in Bagley Wood, near Oxford [*R.A.M.*, xi, p. 140] lead the author to believe that much of the poor thrift there of the European larch (*Larix decidua* Mill.) [*L. europaea* DC.], Japanese larch (*L. kaempferi*), and three eastern Asiatic larches

(*L. gmelini*, *L. gmelini* var. *japonica*, and *L. gmelini* var. *Principis Rupprechtii*), is due to the detrimental action on the trees of what he terms permanent defoliation, i.e., that resulting from the killing by various agents, among which frost and birds are the most serious, of the growing points or whole shoots. There was evidence that in that locality the European larch is more liable to this type of injury, owing to complete destruction of many dwarf shoots, than the other species in which the tendency is for the shoot either to remain uninjured when the leaves are killed, or to have only its growing point killed, in which case two or more buds develop in the axil of the scale leaves, and a multiple dwarf shoot is formed. The chief fungal agent causing defoliation of larches in the wood in question is *Meria laricis* but this is rarely serious except in the nursery. Although *L. gmelini* and its two varieties are defoliated by frost almost every year, they have considerable powers of endurance in this climate, and appear to be more hardy than *L. europaea* in respect of liability to canker [*Dasyscypha calycina*: ibid., xi, p. 141] and to death of dwarf shoots on account of defoliation.

PEARSON (R. S.). **Report of the Director of Forest Products Research for the year 1931.**—*Rept. Forest Products Res. Board for the year 1931*, pp. 4–44, 8 pl., 2 figs., 1 graph, 1932.

This report gives a brief summary of work in progress on timber-rotting fungi and timber preservation at the Forest Products Research Laboratory, Princes Risborough [cf. *R.A.M.*, xi, p. 487]. The collection of wood-destroying fungi maintained in pure culture at the Laboratory now numbers over 160 species.

FINLAYSON (E. H.). **Report of the Director of Forestry 1931–2 (fiscal year ended March 31, 1932).**—*Dept. of the Interior, Canada*, Ottawa, F. A. Acland, 19 pp., 1932.

The following items of phytopathological interest, in addition to those already noticed from another source, occur in this report [cf. *R.A.M.*, xii, p. 123]. A laboratory test showed that wood-blocks impregnated with dinitrophenol and placed under running water for 30 days retain 44 per cent. of the preservative, indicating greater permanency under the same conditions than is shown by zinc chloride or copper sulphate.

The creosote treatment of fence posts [ibid., xii, p. 1] may be cheapened by floating the preservative in the treating tank on a strong solution of brine, which is thus absorbed by the lower part of the post, while the portion near the ground line, where protection is most needed, is permeated by the creosote. Incising was found to produce satisfactory results in the creosoting of red pine [*Pinus resinosa*] and jack pine [*P. banksiana*] by the hot and cold tank process [cf. ibid., xii, p. 70]. Water-soluble preservatives tend to ascend posts set in the ground, so that decay starts at soil level.

CAMPBELL (W. G.). **The chemistry of the white rots of wood. III. The effect on wood substance of Ganoderma applanatum (Pers.) Pat., Fomes fomentarius (Linn.) Fr., Polyporus**

adustus (Willd.) Fr., Pleurotus ostreatus (Jacq.) Fr., Armillaria mellea (Vahl) Fr., Trametes pini (Brot.) Fr., and Polystictus abietinus (Dicks.) Fr.—*Biochem. Journ.*, xxvi, 6, pp. 1829–1838, 1932.

A tabulated account is given of the author's further investigations on the chemistry of the white rots of wood [*R.A.M.*, xi, p. 342]. The experimental procedure and analytical methods were similar to those used in the previous studies, except in *Armillaria mellea* [ibid., xii, p. 130] on cherry (*Prunus avium*). Here it was necessary to determine the comparative specific gravity of sound and decayed wood by the technique of Hartmann and collaborators (*Journ. Amer. Ceramic Soc.*, ix, p. 298, 1926), involving the displacement of sand by samples of standard size and shape.

The fungi under investigation were divided into three groups as follows: (1) *Ganoderma applanatum, Fomes fomentarius, Polyporus adustus*, and *Pleurotus ostreatus* [ibid., xi, pp. 81, 684; xii, p. 44]; (2) *A. mellea*; and (3) *Trametes pini* and *Polystictus abietinus* [ibid., xi, p. 615]. The chemical bases for the three groups are as follows: (1) early attack on lignin and pentosans and delay in the disorganization of cellulose; (2) early disintegration of cellulose and its associated pentosans, and delayed attack on lignin; and (3) early decomposition of both lignin and cellulose in varying proportions. The material to be decayed by the fungi of group (1) consisted of fresh, air-dried, sterilized 60–80 mesh beech wood flour. In the samples inoculated with *G. applanatum* and *F. fomentarius*, fairly large, tough mycelial wefts developed on the surface, 2·76 gm. of mycelium (2·12 per cent.) being obtained from 130·32 gm. wood decayed by the former fungus and 3·93 gm. (3·02 per cent.) from the same weight of wood rotted by the latter. The total losses in weight caused by these organisms were 10·61 and 15·75 per cent., respectively.

The approximate loss of weight in the heart wood of cherry attacked by *A. mellea* was 25 per cent.

The effect of *T. pini* was observed on a sample of silver fir [*Abies pectinata*], the rot of which was found to be comparable to other white rots previously studied, while the analytical data agreed with those of Hawley and co-workers (*Cellulosechemie*, xi, p. 259, 1930) on the same fungus. According to Thaysen and Bunker [*R.A.M.*, vi, p. 500] *P. abietinus* causes a rot in which cellulose is depleted in the early stages, while the lignin is not attacked until decay is well advanced. The present data, however, do not support this statement. In the preliminary stages of decay, lignin is attacked to a proportionately greater degree than cellulose, while of the two pentosan groups those not associated with the cellulose are more liable to disintegration.

It is suggested that the ultimate primary reactions involved in all white rots are oxidation and hydrolysis, the main variants on which the above-mentioned subdivision depends being the incidence in point of time of such reactions, the course of possible secondary reactions, and the rates of the several reactions.

In the white rots the total alkali-solubility of the decayed wood as a percentage of oven-dry sound wood reaches a maximum and begins to decline at a much earlier stage than in the brown rots.

LINDGREN (R. M.), SCHEFFER (T. C.), & CHAPMAN (A. D.). **The chemical control of lumber and log staining and molding fungi.**—*Journ. of Forestry*, xxx, 6, pp. 714–721, 3 figs., 1932.

The following points of interest, in addition to those already noticed from another source, occur in this account of the authors' experiments on the chemical control of timber-staining (*Ceratostomella* spp.) and moulding fungi (mainly Moniliales) in the United States [*R.A.M.*, xi, p. 816].

In the Gulf States and Lower Mississippi Valley, where the chief losses occur, the sapwoods of pine and red gum (*Liquidambar styraciflua*) suffer the most extensive damage from the above-mentioned causes, yellow poplar (*Liriodendron tulipifera*), *Magnolia grandiflora*, black gum (*Nyssa sylvatica*), and oak being less susceptible. Freshly cut stock piled during warm, wet weather or without ample ventilation at any time of the year may be noticeably discoloured within 72 hours after sawing. Tests have shown that within 48 hours the stain organisms may be firmly enough established in the interior of the lumber to neutralize partially or wholly the efficacy of any treatments applied after that time. Stain development may be prevented by a reduction of the moisture content of the piled wood to about 20 per cent. of its oven-dry weight. In the case of logs in contact with the ground under humid conditions, the stain may penetrate 12 to 18 in. within three weeks after cutting and up to 6 ft. within three months.

The following large-scale chemical treatments gave satisfactory results: on pine, 0·01 per cent. solutions of ethyl mercury chloride and ethyl mercury phosphate, 0·37 per cent. sodium ortho-phenylphenolate, 0·48 per cent. sodium tetrachlorophenolate, and 5 per cent. soda; on hardwoods, the ethyl mercury and sodium tetrachlorophenolate treatments and 5 per cent. commercial borax. The immersion periods ranged from 10 to 15 seconds, and the solutions were kept at air temperature or at 160° F. The treatments can be applied at a cost of about 12 cents. per 1,000 board ft. of lumber, and one of the ethyl mercury compounds has been adopted on a commercial scale at over 100 mills in the United States, Canada, Mexico, and the Philippines. Logs may also be satisfactorily treated with creosote, the ends being coated with a mixture of cresylic acid and filled hardened gloss oil.

FRITZ (CLARA W.). **Division of Pathology.**—*Forest Products Laboratories of Canada. Programme of work 1932–1933*, pp. 23–31, [? 1932. Mimeographed].

In 1927 *Trametes pini* and two other unnamed fungi (2) and (3) were isolated from freshly cut jack pine [*Pinus banksiana*] sleepers showing a dark red stain, a defect that largely interferes with the value of this timber to the Canadian railway companies. *T. pini* occurred in 88·8 per cent. of the cultures. Sound blocks inoculated with fungus (2) rapidly developed red stain in pure culture. *T. pini* was found, in an examination of jack pine sleepers with white pocket rot [*R.A.M.*, xi, p. 614; xii, p. 123] to be less viable in seasoned than in green wood, the opposite being the case with fungus (2). Further investigations showed that red stain may be caused either by *T. pini* or fungus (2), but red rot

is the advanced stage of red stain due to the former only. In mechanical strength the red-stained wood is practically equal to sound material. Sleepers treated with creosote were found to be largely protected against secondary wood-destroying fungi, which are very active in untreated red-stained *P. banksiana* material.

It is estimated that the loss to white pine [*P. strobus*] users from blue stain fungi [*Ceratostomella* spp.] in 1928 (a warm, humid season) amounted to $1,000,000, the corresponding figure for normal years being $200,000 to $300,000. Good control of this defect was obtained in the Ottawa Valley by treatment of the wood with three organic mercury compounds, including ethyl mercury chloride and soda (lignasan) [see preceding abstract].

Conservative estimates indicate that the annual losses to the pulp and paper industry through deterioration of wood in the block pile reach at least $5,000,000. An examination of 50 sticks of pulpwood (25 of 1928 and 25 of 1930 storage) in Quebec showed 2·15 per cent. advanced rot, 28·80 per cent. incipient rot, and 30·45 per cent. sapwood stain in the former, the corresponding figures for the latter being 1·05, 22·79, and 6·33 per cent., respectively.

SCOTT (R. M.). **Preservative treatment of infected hardwood.**—*Commonwealth Engineer*, xix, 12, pp. 401–406, 4 figs., 1 diag., 1932.

The engineering departments of two semi-public bodies in Melbourne were recently put to considerable trouble and expense in sterilizing and preserving large stocks of jarrah [*Eucalyptus marginata*] and red gum [*E. rostrata*] blocks in which fungus infection (probably by *Coniophora cerebella*) was detected.

One affected stock consisted of 750,000 unused jarrah paving blocks that had been close stacked in the open for three or four years. The main infection (amounting to 25 per cent. or more in some of the worst cases) appeared as black rhizomorphs on the surface of the blocks. These organs spread with a vine-like growth in all directions and readily spanned gaps up to ½ in. across. In severe cases the blocks had been reduced to a pithy consistency or were even disintegrated. Three other forms of fungous infection were observed in these stacks, namely, bright orange strands, a pale yellowish, powdery growth, and a bluish-grey, felted surface growth, the two last being certainly moulds.

Owing to the high risk of infection consequent on the rapid spread of the black fungus, it was decided to sterilize all the blocks and apply a preservative to prevent recontamination. Two methods of treatment were successfully employed, namely (1) steaming and subsequently creosoting, and (2) cooking in creosote oil or other preservative. In method (1) 1,500 to 1,600 blocks were stacked, adequately spaced, in a flat-topped truck and steamed for two hours at 212° F. or for three hours at 160°, 100 per cent. relative humidity, the latter temperature being preferable as less likely to cause warping while equally toxic to the fungus. On completion of the steaming the blocks were dipped for several minutes in hot creosote oil. In method (2) the blocks were loaded haphazard into bitumen kettles containing tar-oil, where they

remained for 3 hours at 160°, 2½ at 180°, and 2 at 210°. The capacity of the kettles was 800 to 900 galls., corresponding to 800 to 1,000 blocks. The tar-oil used comprised the heavier fractions distilling from coal-tar at 216° [*R.A.M.*, xi, p. 758].

The following results were given by compression tests of the ultimate strengths in end bearing: (*a*) sound blocks, average of 8 tests, 6,900 lb. per sq. in.; (*b*) partly infected (9 tests), 5,980 lb.; (*c*) badly infected (8 tests), 5,770 lb., the corresponding moisture contents being (*a*) 17·8, (*b*) 20·9, and (*c*) 15·9 per cent., respectively. In actual practice 10 galls. of tar were consumed for 960 large blocks, or 1·58 oz. per block. In no case had the oil penetrated below $\frac{1}{16}$ in. after two hours. The total cost of the treatment (including labour) was 5*s.* 4*d.* per 100 ft. super., or £1 4*s.* 9*d.* per 1,000 blocks, an expense regarded as fully justified.

OGILVIE (L.). **Investigations on vegetable diseases in the Bristol Province.**—*H*[*ortic.*] *E*[*ducational*] *A*[*ssoc.*] *Year Book*, i, pp. 45–48, 1932.

Brief, popular notes are given on the more important diseases of the following vegetables observed in the Bristol Province since 1930: asparagus, dwarf and runner beans [*Phaseolus vulgaris* and *P. multiflorus*], leeks, lettuce, mint, onions, parsnips, peas, and vegetable marrow [cf. *R.A.M.*, xi, p. 143].

ROCHLIN (EMILIA). **Zur Frage der Widerstandsfähigkeit der Cruciferen gegen die Kohlhernie (Plasmodiophora brassicae Wor.).** [Contribution to the question of the resistance of crucifers to finger-and-toe (*Plasmodiophora brassicae* Wor.).]—*Phytopath. Zeitschr.*, v, 4, pp. 381–406, 7 figs., 1932.

A comprehensive account is given of the writer's studies, conducted in 1930–1 at the Leningrad Plant Protection Institute, on the reaction to finger-and-toe (*Plasmodiophora brassicae*) of nearly fifty kinds of wild and cultivated crucifers [cf. *R.A.M.*, ii, p. 432; iii, p. 694].

The plants were set in soil heavily infested with the spores of the fungus and the percentage of infection ascertained. The highest degree of infection (100 per cent.) occurred in *Sinapis* (*Brassica*) *arvensis* [charlock or *B. sinapis*], the Braunschweig, Kopenhagen, and Amager cabbage varieties, *Hesperis lutea*, *Succovia balearica*, and *Carrichtera vella*, followed by *Barbarea rupicola* (99), *Iberis pinnata* (82), *Sinapis* [*Brassica*] *alba* (81), *Turritis glabra* (79), *Cochlearia danica* (75), *I. umbellata* (73), and a number of others with over 50 per cent. *C. officinalis*, *Thlaspi oliveri*, *Isatis glauca*, swede (S. Krasnosselski), *B. nigra*, two varieties of *Barbarea vulgaris*, *B. bracteosa*, *B. lyrata*, *Aubrietia olympica*, *A. deltoidea*, *H. alpina*, *H. fragrans*, and *H. matronalis* var. *nana* remained uninfected.

It is apparent from these data [which are tabulated] that the reaction of the hosts to *P. brassicae* is not determined by their systematic position within the crucifer family. A thorough investigation was accordingly made of members both of susceptible and resistant genera, paying special attention to anatomical structure (primarily of the root system) and chemical composition, with

a view to elucidating the factors conferring immunity from infection. Both resistant and susceptible plants were found to show a similar primary root structure, so that this character evidently plays no part in determining the reaction to finger-and-toe. In older plants, however, the penetration and spread of the parasite may be checked to some extent by the presence of periderm and collenchyma, as well as by a relatively compact xylem.

The entry of the parasite into the root hairs and epidermal cells [ibid., v, p. 529; x, p. 3; xi, p. 16] was studied chiefly in cabbage and *B. sinapis*, small plasmatic bodies, little larger than the spores, passing through the gelatinized wall which no longer stains blue with chlor-zinc-iodine at the point of passage. After three to five days the infected cells contain larger masses of loose, coarsely granular protoplasm. Subsequent spread in the tissues is effected both in an active and a passive manner, the former characterized by migration through the dissolved and disorganized cell walls, primarily of the cortical parenchyma and medullary rays, and the latter by the extension of the parasite by means of the division of the infected host cells. The swellings and excrescences on the roots are due to both hyperplasia and hypertrophy of the cells in the affected regions.

A study of the biochemical properties of the experimental plants showed that a protective action against the fungus is conferred by the strong-smelling glucosides yielding volatile mustard oils on splitting by the enzyme myrosin, viz., sinigrin, gluconasturtiin, glucotropaeolin, and glucocochlearin. In this connexion Sacharoff's observations (*Arb. Phytopath. Stat. Inst. für Landw. Moskau*, 1, 1916) are of interest, showing that infection by *P. brassicae* was most severe in turnips with an abundance of sugar in the cell sap, whereas those with an acid cell sap were immune.

PETERSEN (E. J.). **Undersøgelser over Bønnebakterioser i sommeren 1931.** [Investigations on Bean bacterioses in the summer of 1931.]—*Tidsskr. for Planteavl*, xxxviii, 5, pp. 826–856, 2 pl., 1932.

A serious bacterial disease of beans [*Phaseolus vulgaris*], not previously observed in Denmark, was reported from a number of nurseries and market-gardens during the summer of 1931 [*R.A.M.*, xi, p. 768]. The most prominent symptom was the development of yellowish-brown, later pure brown, dark-edged spots of irregular extent on the leaves. On the stems and petioles the lesions were reddish or brown and generally oblong. Plants attacked at an early stage of growth withered completely without forming pods. When infection occurred later small pods were formed, but they turned brown and shrivelled away without producing seed.

A rod-shaped bacterium was isolated from diseased plants, inoculated with positive results into Wax Flageolet seedlings, and reisolated from the latter. The best infections were obtained at a temperature of about 30° C. The organism occurs singly or in pairs, stains with fuchsin, methylene blue, and other basic aniline dyes, is Gram-negative, non-acid-fast, and measures 1·3 to 3·5 (average 2·3) by 0·8 μ: gelatine is liquefied and milk peptonized. Good growth occurs on Difco agar (greyish-yellow, glistening,

fluorescent colonies) and a number of other standard media, Fermi's synthetic solution being specially favourable. The minimum temperature for growth is 5° to 7° and the maximum 38° to 42°; the optimum is not clearly defined but seems to range from 15° to 30°. The organism succumbs to ten minutes' exposure to a temperature of 46°, and is unable to survive anaerobic conditions. Development occurs at a hydrogen-ion concentration range from P_H 5 to 8·4, the optimum lying between P_H 5·7 and 6·4.

The systematic position of the bean organism is discussed at some length, the conclusion being reached that it falls between *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [ibid., xii, p. 1] and *P.* [*Bact.*] *viridiflava* [ibid., ix, p. 695], approaching more closely to the latter; it is therefore provisionally named *P. viridiflava* var. *concentrica*.

The organism lost virulence on culturing during six months, a further point in common with *Bact. viridiflava*. There is some indication that the green varieties of bean are more resistant than the wax ones to the bacterial disease under discussion. Infection is presumably carried on the seed and disseminated by various secondary agencies, such as rain and wind.

It is stated in a postscript to this paper that several species of *Phytomonas* were found in the summer of 1932 to be implicated in the causation of the bean disease. They were detected in beans purchased for seed, some samples of which were so heavily infected that they rotted away in the course of germination tests. A further report on these investigations is in preparation.

NEŮWIRTH (F.). **Choroby vzcházející Řepy a pathologický význam jejich organických průvodců.** [Seedling diseases of the Beet, and the pathological significance of the organisms associated with them.]—*Ochrana Rostlin*, xii, 5–6, pp. 104–130, 7 figs., 1932.

By far the greatest part of this paper is a comprehensive review of the literature since 1859 dealing with the problem of the causation and control of the seedling root rots and blights of the sugar beet. A brief account is given of the author's inoculations of beet seedlings under controlled conditions with *Bacterium* [*Bacillus*] *mycoides* [*R.A.M.*, ix, p. 152] and *Rhizoctonia violacea* [*Helicobasidium purpureum*], both of which gave negative results, although the latter infected and rotted 4- or 5-months' old plants [ibid., xii, p. 135]. In 1926, which was an abnormally wet year in Czecho-Slovakia, he repeatedly isolated from blighted beet seedlings from various localities a species of *Acrostalagmus* which was also found in the seed clusters in 1927, although in that year it was not seen on any of the beet seedlings examined. In pure culture the fungus formed a dense, cottony, white aerial growth. The hyphae are very indistinctly septate, hyaline, and up to 3 μ thick. The conidiophores arising laterally on the hyphae are either erect or decumbent, simple or branched, and bear clumps of conidia at their apex which in some cases may be slightly swollen. The conidia which are formed successively, are agglomerated at the tip of the conidiophore by a slimy substance; they are hyaline, of greatly varying shape, and measure 3 to 5 by 1 to 1·5 μ. The fungus is not named

and its pathogenicity was not tested. The author also made a few inoculation experiments with *Penicillium crustaceum* and *Rhizopus nigricans*, both of which attacked and killed young beet seedlings grown under conditions favouring the fungi.

DANA (B. F.). **Some experiments with mechanical transmission of the curly-top virus.**—Abs. in *Phytopath.*, xxii, 12, pp. 997–998, 1932.

The writer has used a modification of Sein's multiple needle technique for the transmission of sugar-cane mosaic [*R.A.M.*, ix, p. 678] for the transference of the curly top virus from sugar beet [ibid., xii, p. 195] to sugar beet, tomato, and spinach, and from tomato to sugar beet. The first attempt to transmit the virus from a recently diseased to healthy sugar beet was successful in 8 out of 16 plants in one lot, but trials at a later stage gave a low percentage of positive results. This was also the case in the transmission experiments from sugar beet to tomato and spinach and from tomato to sugar beet. The virus is evidently most active soon after its introduction into a plant, at which time also it is more readily transferable from one host to another than at any subsequent period.

COSTA (T.). **Su alcune prove di lotta contro lo Cercospora beticola eseguite a Monzon (Huesca) per conto della 'Compañia de Industrias Agricolas'.** [On some control experiments against *Cercospora beticola* conducted at Monzon (Huesca) on behalf of the 'Agricultural Industries Company'.]—*Indus. Sacc. Ital.*, xxv, 12, pp. 535–538, 1932.

Continuing his experiments on the control of leaf spot of sugar beets (*Cercospora beticola*) in Spain [*R.A.M.*, x, p. 427], the writer gave the following treatments: (1), (2), and (3) spraying with 2 per cent. Bordeaux mixture every 10, 20, or 30 days beginning 1st June, 1st July, and 1st August, respectively; (4) one series of plots (A) sprayed with 2 per cent. Bordeaux mixture every 10 days from 1st June, (B) every 20 days at 0·5 per cent., and (C) every 30 days at 0·5 per cent. to 1st August, and from 10th August onwards at 0·2 per cent. All the tests were discontinued in October.

The following results [shown in tabular form] were obtained. Series (1) average weight of beets sprayed at 10-day intervals, 439 gm., average sucrose 15·11 per cent., and total sucrose 66·33 gm., the corresponding figures for the 20-day interval being 375 gm., 14·93 per cent., and 55·98 gm., and for the 30-day 354 gm., 13·89 per cent., and 49·17 gm., respectively, while the control figures were 359 gm., 11·97 per cent., and 43 gm. In series (2) the average weight in the 10-day interval plots was 390 gm., average sucrose 14·89 per cent., and total sucrose 58·07 gm., the corresponding figures for the 20-day interval being 389 gm., 14·08 per cent., and 54·77 gm., and for the 30-day 420 gm., 13·53 per cent., and 56·73 gm., respectively, while the control yielded 393 gm., 11·79 per cent., and 46·31 gm. In series (3) the average weight in the 10-day interval plots was 370 gm., average sucrose 14·81 per cent., and total sucrose 54·79 gm., the corresponding figures for the 20-day interval

being 441 gm., 14·51 per cent., and 63·98 gm. and for the 30-day 394 gm., 13·66 per cent., and 53·82 gm., respectively, while the control produced 342 gm., 12·03 per cent., and 41·14 gm. In series (4) the (A) plots gave an average weight of 400 gm., average sucrose 16·10 per cent., and total sucrose 64·40 gm., the corresponding figures for (B) being 405 gm., 15·21 per cent., and 61·60 gm., for (C) 399 gm., 14·37 per cent., and 57·33 gm., and for the control 410 gm., 12·60 per cent., and 51·66 gm.

It is evident from these data, that notwithstanding the heavy rains in June and July, which somewhat neutralized the effects of the spray, the differences in yield and purity between the treated and untreated beets were very considerable. As in previous trials, the importance of an early start and frequent applications was apparent. The unsprayed plots suffered severely from the attacks of the fungus.

In a separate experiment a Polish E strain was planted side by side with a Polish Z strain, a portion of each being treated with 2 per cent. Bordeaux mixture at 10-day intervals from 1st July onwards. Analyses made at fortnightly intervals from 15th August to 30th October showed that the high sugar strain Z loses relatively less in sugar weight than the high yielding strain E. On 15th August the average weights of the leaves and roots of Z (control) were 415 and 327 gm., respectively, sucrose 12·08 per cent., the corresponding figures for the sprayed plot being 448 and 296 gm. and 11·51 per cent., respectively. On 30th October the average leaf and root weights of Z (control) were 49 and 402 gm., respectively, sucrose 12·79 per cent., the corresponding figures for the sprayed plot being 111 and 386 gm. and 15 per cent., respectively. The following values were obtained for E: average weight of leaves and roots on 15th August (control) 432 and 355 gm., respectively, sucrose 10·88 per cent.; 30th October 49 and 447 gm. and 10·48 per cent., respectively. Sprayed plot: 15th August, leaves and roots 406 and 296 gm., respectively, sucrose 10·79 per cent., the corresponding figures for 30th October being 152 and 457 gm. and 12·93 per cent., respectively.

BÖNING (K.). **Das Schwarzwerden der Rettiche.** [The blackening of Radishes.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, x, 9–10, pp. 205–219, 8 figs., 1932.

Radishes in the Munich district and other parts of south Bavaria have recently been severely attacked by *Aphanomyces raphani*, the causal organism of 'black root' in the United States [*R.A.M.*, viii, p. 606]. The first symptom of infection is a faint greyish-blue, translucent discoloration of the subepidermal root tissues, which generally advances chiefly in a transverse direction and remains confined to the outer layers. In this way the lesions frequently assume the appearance of bands of varying breadth partially or wholly encircling the tap root. The infection gradually spreads inwards, producing a bluish-black discoloration, accompanied by various malformations due to the unequal growth of the diseased and healthy portions of the radish. The affected epidermal and subepidermal tissues are liable to rupture, giving rise to lenticular fissures that may ultimately involve the deeper

layers. Here infection proceeds primarily in a radial direction, the medullary rays being extensively invaded, while the cambial zone often remains intact so that further growth is possible. The decay caused by *A. raphani* is of the dry type, but secondary infection by bacteria may eventually lead to the softening and disintegration of the root. In seedlings and young plants the disease may appear on the hypocotyl, cotyledonary leaves, petioles, and leaf blades in the form of dark stripes and markings, causing atrophy, yellow discoloration, and sometimes the death of the affected parts. This form of infection appears to occur in the soil at a very early stage of germination.

The writer's observations on the morphology and mode of infection of the radish parasite agree with those of Kendrick in the United States [ibid., vii, p. 4]. The fungus invades the roots from the soil chiefly through the natural wounds made by the emergence of the lateral roots, another favourable site for infection being the ruptured parts of the primary hypocotyl. Wounds inflicted by insects or implements also give ready access to the pathogen, which further seems capable of attacking completely sound tissues. Infection probably takes place by means of zoospores. The oospores develop in the outer layers of the diseased radishes, on the disintegration of which they are introduced into the soil and there act as a source of primary infestation. The disease is then perpetuated by the plant débris, which is thrown on to the manure heap and later used in frames or on the field. The frequent neglect of crop rotation in market-gardens is an important factor contributing to the prevalence of black root, which is further favoured by the excessive use of stable manure as a fertilizer. Experiments showed that the incidence of infection was much higher during the hot weather in July than at the lower autumn temperatures.

The Eiszapfen [Icicle] and a number of other early forcing white varieties were found to be highly susceptible to *A. raphani*, while some of the later summer red types showed a fair degree of resistance.

Control measures based on improved methods of cultivation are outlined. Moderately successful results were obtained in soil disinfection tests by the use of 2 per cent. formalin or calcium cyanamide (50 gm. per sq. m.).

Dana (B. F.) & McWhorter (F. P.). **Mosaic disease of Horse-Radish.**—Abs. in *Phytopath.*, xxii, 12, pp. 1000–1001, 1932.

Degeneration in the form of dwarfing and yellowing was observed among the horse-radish plantings of Oregon during 1930–1. The roots were small, with rough, scaly surfaces and were rendered unsaleable by their pithy texture and dark streaking. The foliage of root cuttings from diseased plants, potted and forced at different temperatures, was more or less stunted, the leaf blades showing a pronounced filiform segmentation. The young leaves exhibited a noticeable mosaic-like mottling, characterized by pale green interveinal areas interspersed with dark green, but no apparent clearing of the veins. The old leaves developed black, elongated lesions in the epidermis and outer cortex of the petioles.

In cross-inoculations on turnip and mustard by a modification of Sein's multiple-needle method [see above, p. 349], 100 per cent. of the plants contracted symptoms similar to those on horse-radish within 10 to 12 days.

BOURIQUET (G.). **Les maladies du Manioc à Madagascar.** [Cassava diseases in Madagascar.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 8–9–10, pp. 290–297, 1 pl., 1932.

This is a brief morphological and economic account of the chief diseases of cassava in Madagascar, namely, mosaic [*R.A.M.*, xi, p. 762], leaf spot (*Cercospora cassavae*) [ibid., xi, p. 130; xii, p. 137], a die-back of the twigs (*Gloeosporium manihotis*) [ibid., xi, p. 97], and root rot (*Phaeolus manihotis*) [ibid., xi, p. 492]. Control measures are briefly discussed in each case.

LAMBERT (E. B.). **Mushroom growing in the United States.**—*U.S. Dept. of Agric. Circ.* 251, 34 pp., 14 figs., 3 graphs, 1 map, 1932.

In addition to instructions for the cultivation of edible mushrooms (*Agaricus* [*Psalliota*] *campestris*) [cf. *R.A.M.*, xii, p. 72] in the United States, notes are given on the following diseases of this crop and their control; bubbles (*Mycogone perniciosa*) [ibid., xii, p. 198], bacterial spot (*Bacterium* [*Pseudomonas*] *tolaasii*), green mould [? verdigris caused by *Aspergillus, Penicillium*, and *Trichoderma* spp.: ibid., xi, p. 493], white plaster or flour mould (*Monilia* [*Oospora*] *fimicola*), and truffles disease (*Pseudobalsamia microspora*).

VILLEDIEU (G.). **Cuivre et mildiou.** [Copper and mildew.]—*Prog. Agric. et Vitic.*, xcviii, 49, pp. 536–539, 1932.

The author states that the experience of the severe vine mildew [*Plasmopara viticola*] epidemic of 1932 in France gave a striking confirmation of his views on the action of Bordeaux mixtures on the fungus [*R.A.M.*, iv, p. 297], and again demonstrated the necessity of spraying the vines after each heavy rain, if the disease is to be effectively controlled. While for the first two days the basic mixtures owe their activity to the free lime, and are then active as a result of the concentration of their soluble salts, the final action is one of contact with the insoluble basic copper compounds. When treated parts have been washed by heavy rain, the remaining deposit can only protect the exact spots it covers. A new spraying is required if the parts are to be adequately protected. At the same time, he reiterates his opinion [ibid., x, p. 156], which is supported by Schaffnit's recent work [ibid., xi, p. 799], that excessive fertilization of the vines with nitrogen renders them more susceptible to mildew.

CHRESTIAN (J.). **Algeria: Phoma flaccida on Vine.**—*Internat. Bull. of Plant Protect.*, vi, 12, pp. 201–202, 1932.

Attention is drawn to a severe outbreak of *Phoma flaccida* [*R.A.M.*, x, p. 642] on vines in the Mitidja plain, Algeria, where the fungus has hitherto been known only in a relatively mild form. Much of the damage resulted from infection of the stalks

of the bunches, causing the grapes to wither. The Aramon, Hybrides-Bouchet, and Carignan varieties were chiefly affected. The spread of the organism is thought to have been favoured by the abnormally cool and wet spring and summer of 1932.

PFEIFFER. **Die auffallend verbreitete Verfärbung der Rebenblätter im Jahre 1932.** [The remarkably widespread discoloration of Vine leaves in the year 1932.]—*Zeitschr. für Obst-, Wein- und Gartenbau*, lviii, 12, pp. 246–248, 1932.

Leaves of all types of vine, both black and white, showed an extensive red and yellow discoloration during 1932 in Germany, especially on sandy soils in which the usual fertilization had been omitted for the first time for some years. The residues of previous applications of potash salts were found to have accumulated in the upper layers of the soil, with the result that the plants absorbed excessive amounts of this mineral unbalanced by other nutrient materials, and metabolic disturbances ensued. The symptoms were most marked among widely-spaced vines exposed to direct sunlight. It is recommended that stable manure should be applied during the transition from a complete to a restricted fertilizing scheme.

SALMON (E. S.) & WARE (W. M.). **Department of Mycology.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxi, pp. 13–21, 1933.

In 1932, the edges of the heart leaves of lettuces in Sussex were attacked by *Bacterium marginale* [*R.A.M.*, xi, p. 143]. The plants were cut in the morning with the dew on them and sent in sacks to the coastal towns; on the following day the hearts were found to be slimy or rotting, so that the lettuces were unsaleable. As the bacteria were perhaps splashed on to the leaves by rain, it was recommended that straw should be placed between the rows.

In November, 7-year old Worcester Pearmain apple trees near Dartford showed the presence of *Helicobasidium purpureum* round the trunks at ground level. The fungus was a dull or brownish-purple with a white fringe. It was not found on the roots or in the soil, but was noted on the stems of 8-year old interplanted gooseberry bushes, 1 to 2 in. below to 2·5 in. above soil level, completely encircling the stems and covering the fork of the lowest main branches. No damage was noticed on either host.

Monilia [*Sclerotinia*] *cinerea* f. *mali* caused considerable injury to Allington Pippin and other apple varieties in East Kent and an almost total loss of blossom on old Lord Derby trees. Several instances of eye rot from which a *Fusarium* was isolated were encountered, especially on Worcester Pearmain, though Lane's Prince Albert was also affected. The eye rot of Worcester Pearmain apples has been shown by Dillon Weston to be due to the *Fusarium* stage of *Nectria galligena* [ibid., vi, p. 424].

Groups of sporophores of *Pholiota squarrosa* were present at the base of some 10 per cent. of a number of 50- to 100-year old cherry trees that were dying off branch by branch.

Mushrooms infected by *Dactylium dendroides* were received;

the results of laboratory inoculations tended to support the view that the organism is parasitic on mushrooms.

Hop downy mildew (*Pseudoperonospora humuli*) [ibid., xi, p. 471] was completely controlled by systematic spraying which was carried out by about 80 per cent. or more of the Kentish growers. A disquieting feature was the appearance of mycelium in the 'hill', which sometimes resulted in the death of the plant.

Trabajos de las Estaciones de Fitopatología agricola en el año 1931. [Work of the Stations of Agricultural Phytopathology in the year 1931.]—*Bol. Pat. Veg. y Ent. Agric.*, vi (*1931*), 23–26, pp. 171–198, 1932.

A study is in progress at the Madrid Central Station of Agricultural Phytopathology on the deterioration of chilli pepper [*Capsicum annuum*] associated with three different conditions, namely, fusariosis, common mosaic [*R.A.M.*, xi, p. 804], and a virus disease distinct from the foregoing, the last-named being the most serious. In Valencia and Catalonia the same plant suffers from a disease known as 'whitewash' [ibid., xi, p. 281], the leaves, shoots, and fruit peduncles attacked by which yielded a species of *Alternaria*. Selected seed from apparently healthy plants from Rioja failed to maintain its resistance to the disease at the Valencia Station of Agricultural Phytopathology, where severe infection occurred. Various other fungi have been isolated from diseased chilli plants at the Madrid Station, so that the exact cause of the 'whitewash' requires further investigation. A similar disease has been observed on broad beans [*Vicia faba*] in Valencia, where heavy losses from this source have been reported. The symptoms include loss of chlorophyll, reduction of foliage, incomplete ripening of the seed, and general decline of vitality.

An attempt to isolate *Blepharospora* [*Phytophthora*] *cambivora* from diseased chestnut and vine material from Lugo gave negative results. The latter plant, however, yielded mycelium and a profusion of rhizomorphs, probably of a Hymenomycete which may well be the agent of the disease. An apparently new vine disease occurring in Almeria and known as 'yellows' is attributed to a species of *Stereum*.

Melons in the Masalfasar and Alboraya districts of Valencia suffer from a gummosis which kills the affected plants in a few days. The causal organism is believed to be a species of *Fusarium* entering the plants through the secondary roots.

Thompson (A.). **Division of Mycology. Annual Report for 1931.**—*Dept. of Agric. Straits Settlements and Fed. Malay States* (*Technical Reports for the year 1931*), *Bull.* 12, *Gen. Ser.*, pp. 48–52, 1933.

In 1931, stem rot of oil palms, due to the *Fomes* responsible for brown root rot of tea and rubber [*F. noxius*: *R.A.M.*, xi, p. 769; xii, p. 55], was fairly common on most of the older properties in Malaya. Tissues exposed by pruning were satisfactorily protected by a mixture of asphalt and oil. Crown disease and bud rot [ibid., vii, pp. 164, 165] of the same host were also reported, and *Maras-*

mius palmivorus was also prevalent on the palms but did not seriously damage the fruits [cf. ibid., xi, p. 354].

A tea disease resembling brown root rot was reported from Banting. Slime disease [*Bacterium solanacearum*] and *Cercospora* leaf spot [*C. nicotianae*] were the most prevalent diseases of tobacco, the former affecting, on an average, 6 per cent. of the plants. *Piper betle* was appreciably damaged by *Phytophthora colocasiae* [ibid., viii, p. 675; ix, p. 809] and *Sclerotium rolfsii*: weak Burgundy mixture is being used as a soil fungicide in affected areas. A *Rosellinia* was recorded on camphor, *Phoma camelliae* on tea, and *Rhizoctonia* [*Corticium*] *solani* on carrots and Bermuda grass [*Cynodon dactylon*]. The commonest mould-producing fungi on copra [ibid., xi, p. 175] were six species of *Aspergillus*, though *Penicillium glaucum*, *Trichothecium roseum*, and a *Rhizopus* (? *R. nigricans*) were also found, as were (occasionally, on poorly dried copra) a *Cephalosporium*, a *Colletotrichum*, a *Diplodia*, and *Ceratostomella adiposum* [ibid., ix, p. 612].

Report of the Director for the year ending October 31, 1931.—*Connecticut Agric. Exper. Stat. Bull.* 337, pp. 451–493, 11 figs., 1931. [Received March, 1933.]

The following items of phytopathological interest occur in this report. Chestnut trees inoculated with cultures of the blight fungus [*Endothia parasitica*] kept alive saprophytically for 20 years failed to contract infection, which developed, however, in those inoculated with cultures up to two years old. It is hoped that this gradual loss of virulence in old saprophytic cultures may be paralleled under natural conditions, in which case the return of the chestnut to its former prominence in the State is not impossible [*R.A.M.*, xi, p. 161]. At present all the old trees are either dead or dying of blight, but a few healthy sprouts that have survived the disease are found scattered through the woods, which further contain a fair number of seedling chestnuts apparently free from infection. No case of true resistance to the fungus has yet been observed in the native trees under Connecticut conditions.

When healthy cabbage and cauliflower plants were set in soil inoculated with the finger-and-toe organism [*Plasmodiophora brassicae*], 100 per cent. infection developed, the percentage being reduced to 26 and 16, respectively, by the application of $1\frac{1}{2}$ and $2\frac{1}{2}$ tons of hydrated lime per acre. In a greenhouse test, only 15 per cent. of the seedlings in a limed section contracted the disease, as against 50 per cent. in an unlimed.

Amongst the interesting records of diseases reported are the anthracnose of peas (*Gloeosporium* [*Colletotrichum*] *pisi*) [ibid., v, p. 69; vi, p. 273; vii, p. 359], and black root rot [*Thielaviopsis basicola*] on lilac and peony.

The willow scab fungus (*Fusicladium saliciperdum*) [*Venturia chlorospora*] reappeared with great severity after a temporary decline the preceding year [ibid., xi, p. 161]. The common yellow twig variety [*Salix alba* var. *vitellina*] is gradually dying out as a result of infection, especially in the Norfolk district.

Cultivated willows of the golden weeping variety [*Salix babylonica* var. *aurea*] developed heavy infection 12 days after

inoculation with a *Septomyxa*-like fungus, which has been found in Connecticut though the actual material for investigation was sent from New York. The weeping willow (*S. babylonica*) was only slightly susceptible and the Lemley variety very resistant.

Extensive damage was again caused by the lawn fungus [*Helminthosporium* sp.: loc. cit.], the outbreaks of which were of unprecedented intensity, especially on bent [*Agrostis* spp.], being favoured by hot, damp weather.

During the summer of 1931 some 85,000 wild and 8,500 cultivated *Ribes* bushes were destroyed over 4,500 acres in connexion with the white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*] eradication campaign [loc. cit. and ibid., xii, p. 203]. It is estimated that one or more re-eradications will be necessary at five- or eight-yearly intervals. In three towns all the European black currants [*R. nigrum*] were destroyed, the possession of this plant being illegal in the State [see below, p. 381], while 4,632 wild and 255 cultivated *Ribes* bushes were removed from 17,664 acres of the nursery sanitation zones for the cultivation of healthy stock, which now number eleven.

Fifty-first Annual Report of the Ohio Agricultural Experiment Station for the year ended June 30, 1932.—*Ohio Agric. Exper. Stat. Bull.* 516, 128 pp., 2 pl., 7 figs., 3 graphs, 1933.

In the section of this report dealing with botany and plant pathology (pp. 37–45) H. F. Winter and H. C. Young state that hydrophilic colloidal sulphur [*R.A.M.*, xi, p. 427] was found to be toxic to a number of fungi, including *Glomerella cingulata*, *Sclerotinia cinerea*, *Mycosphaerella pomi*, and *Cladosporium fulvum*, most of which are highly resistant to ordinary, finely ground sulphur. Its chief drawback is that it crystallizes rapidly and is then no more toxic than flowers of sulphur. Dried skimmed milk increased the effectiveness of the colloidal sulphur more than any other protective agent tested.

J. D. Wilson reports that carrot leaf spot (*Cercospora apii* [var.] *carotae*) [*C. carotae*: ibid., viii, pp. 352, 630] and leaf blight (*Macrosporium carotae*) [ibid., x, p. 436] have for several years caused serious losses in northern Ohio. One field planted late in April was sprayed with Bordeaux mixture (4–6–50) plus calcium caseinate (1 in 50) on 15th June, when the plants were about 6 in. high, further applications being made at intervals of about ten days on dates which happened to cover the period of heaviest summer rain. When the field was harvested at the end of September it was found that spraying had increased the yield from 544 to 907 bushels per acre; the unsprayed plants were almost defoliated, whereas the sprayed ones were tall, healthy, and green.

Complete control of gladiolus scab (*Bacterium marginatum*) [ibid., xi, p. 428] was obtained by P. E. Tilford as a result of immersing the corms (Francis King and 1910 Rose varieties) for two hours in mercuric chloride (1 in 1,000) or for 5 minutes in calogreen (1 lb. per 2·5 gal. water) [ibid., xi, p. 699]; the untreated controls had 24·4 per cent. severely scabbed.

Tests by L. J. Alexander in the control of tobacco seedling root diseases showed that when 6 per cent. formaldehyde dust was

thoroughly worked into the top four inches of the seed beds at the rate of 3 oz. per sq. ft., the seed then sown and the bed thoroughly watered immediately, the plants which grew up subsequently were dark green, large, all fit for transplanting and compared favourably with others in a steamed bed; the plants in the control plot were worthless.

Two years' tests by R. C. Thomas gave good results in eradicating the fireblight organism [*Bacillus amylovorus*] from cankers by painting them with a solution obtained by dissolving 9 lb. dry zinc chloride powder in 1 qt. water containing 3 oz. hydrochloric acid, heat being used to expedite solution. When dissolved and cooled the mixture was poured into 7 pints of denatured alcohol and stored. This treatment obviated the necessity of cutting out the infected parts.

H. F. Winter reports that the results obtained in the seventh year of the campaign against raspberry diseases again demonstrated that a properly executed system of isolation, inspection, and roguing controls virus diseases [ibid., xi, p. 428]. Some 95 acres of black raspberries [*Rubus occidentalis*] on 26 farms in all parts of Ohio were inspected and rogued four times in 1932. The total number of plants affected with virus diseases was 0·75 per cent. of the Cumberlands and 0·25 per cent. of the Plum Farmers.

Celery yellows (*Fusarium* sp.) [ibid., viii, p. 23] was observed by J. D. Wilson in epidemic proportions in Ohio twice in 1930. In August, 1932, the Golden Phenomenal and Hoover Special varieties were about 90 per cent. diseased, the tall strain of Golden Self Blanching was about 20 per cent. infected, while two strains of Wonderful and Golden Plume showed only 6 to 8 per cent. loss. A dwarf, disease-resistant selection (A.A. 2530) from Michigan State College as well as Golden Prize and Early Fortune showed 2·5 to 3·5 per cent. infection. Columbia (a green variety) had 1·5 per cent. of the plants attacked. A recent selection (V.D. 30) from Golden Self Blanching (also made at Michigan) was completely resistant and appears to be a promising strain.

Botany.—*Forty-fifth Ann. Rept. Georgia Exper. Stat. for the year 1932*, pp. 34–36, 1933.

The following items of phytopathological interest occur in this report. Pimento pepper [*Capsicum annuum*] was attacked with unusual severity during the period under review both by 'ripe rot', (*Vermicularia* [*Colletotrichum*] *capsici*) [*R.A.M.*, xi, p. 804] and anthracnose [*C.* sp.: ibid., ix, p. 436]. Difficulty was experienced in the selection of seed stock free from both diseases, neither of which is amenable to seed treatment.

Groundnuts are subject to infection by two species of *Cercospora* causing leaf spot [cf. ibid., xi, p. 20]. The common practice of planting seed without shelling should be discontinued, since it has been found that a much higher percentage of germination may be obtained from shelled seed, disinfection of which, moreover, is scarcely necessary. Together with southern blight (*Sclerotium rolfsii*) [ibid., xi, p. 621], the leaf spots may reduce the groundnut yield by 50 per cent. Resistance to both diseases exists in some varieties but without the qualities necessary for successful

commercial cultivation. Resistance to leaf spot appears to be inherited as a unit character not linked with any other visible feature, so that it should be possible to combine this character with desirable commercial ones.

The highest yield of marketable cantaloupe melons was obtained from plots sprayed against downy mildew [*Pseudoperonospora cubensis*: ibid., xii, p. 5] with a weak Bordeaux mixture, the increase over the untreated controls being 9·6 crates per acre. The corresponding increases from Oxo-Bordeaux [ibid., xii, p. 240] and 3–4–50 Bordeaux were 6·1 and 4·2 crates per acre, respectively, while high lime Bordeaux (3–9–50) and 1–3–50 copper acetate sprays reduced the yields by spray injury.

LEVINE (M.). **Crown gall on Sahuaro (Carnegiea gigantea).**—*Bull. Torrey Bot. Club*, lx, 1, pp. 9–15, 2 pl., 1933.

No definite evidence has hitherto been available that the Cactaceae are liable to infection by the crown gall organism (*Bacterium tumefaciens*). In 1931 inoculation experiments were carried out on the side ridges of five- to six-year-old sahuaro (*Carnegiea gigantea*) plants from Arizona. The first reaction to inoculation is the formation of a small blackened area round the needle pricks, apparently due to the death of the severely injured cells. The development of tumour tissue is of lengthy duration compared with the reaction of the plants commonly used in experimental studies of crown gall. In *C. gigantea* necrosis persists for over a month and is followed by the formation of smooth, sessile or short-stalked tumours resembling those on beet [*R.A.M.*, x, p. 779] and bearing on one side a large number of densely-set areoles with numerous spines comparable to the leafy shoots frequently associated with tobacco galls and sometimes with those of Jimson weed [*Datura stramonium*] and geranium [cf. ibid., xii, pp. 59, 148]. The tumour tissue remains soft and is composed of parenchymatous cells interspersed with numerous areas of more actively growing, undifferentiated cells. Whorls of cells consisting of protoxylem with well-formed tracheids are abundant in galls sectioned eleven months after inoculation. The outer layers of the gall are composed of small embryonic cells with no trace of an epidermis or palisade tissue.

In similar inoculations on *Opuntia* spp. only necrotic areas developed.

LEDINGHAM (G. A.). **Life-history, morphology, and cytology of Polymyxa graminis.**—Abs. in *Phytopath.*, xxiii, 1, p. 20, 1933.

Marquis wheat seedlings growing in Ontario soil at Toronto were attacked in 1930 by a fungus with large, irregular, septate zoosporangia surrounded by a well-defined membrane and liberating numerous biciliate zoospores through exit tubes. The resting sori are round to elongated and often arranged in lines in the host cells. The multinucleate thalli segment to form spore balls. Two types of nuclear division occur in the development both of the zoosporangia and the resting spores, protomitosis coinciding with the growth of the thallus while mitosis accompanies segmentation. The character of the resting sori and the occurrence of protomitosis

in the growth of the thalli denote relationship with the Plasmodiophorales, while the well-developed zoosporangia point to an affinity with the Chytridiales. The fungus (an obligate parasite) is named *Polymyxa graminis* n.g., n. sp.

SCHEIBE (A.). **Die Schwarzrostepidemie auf dem Balkan 1932.** [The black rust epidemic in the Balkans 1932.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 1, pp. 5–6, 1933.

During 1932 the black rust (*Puccinia graminis*) epidemic among the cereal (especially wheat) crops of the Balkans attained an almost unparalleled severity [*R.A.M.*, xii, p. 150]. In Hungary the anticipated wheat harvest of 18,000,000 doppelzentner was reduced to 14,500,000 owing to the combined effects of rust and abnormal weather conditions (heavy rain at the end of June followed by cloudless days of tropical heat). According to Prof. B. Husz of Budapest, *P. graminis* is annually responsible for heavier damage to the Hungarian wheat crop than *P. glumarum*. In 1932 *P. triticina*, which is usually severe, caused smaller losses than *P. graminis*.

In Jugo-Slavia black rust was also prevalent, especially in the districts along the Hungarian frontier. In the cooler and damper western regions, *P. glumarum* was more in evidence. Rumania and Bulgaria both suffered heavy losses from *P. graminis*, while in the latter country *P. triticina* was also partially responsible for the immense reduction of yield (up to 90 per cent.) along the Danube. In Turkish Thrace and Macedonia, where black rust epidemics are virtually of annual occurrence, the damage was mainly limited to the late varieties. Extensive losses are further reported from southern Poland.

The source of primary infection by *P. graminis* in the 1932 epidemic has not yet been ascertained. There are still large areas in the Balkans where barberries flourish, and the observations of Bulgarian phytopathologists also point to an annual introduction of infective material from the south.

TIEMANN. **Kurze Betrachtung zum Rostbefall des Weizens in Schlesien im Jahre 1932.** [A short survey of the rust attack on Wheat in Silesia in the year 1932.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlviii, 1, pp. 7–8, 1933.

In the middle of July, 1932, the Silesian wheat crops were heavily attacked by black rust (*Puccinia graminis*) [*R.A.M.*, xii, p. 149]. The mean relative humidity for the month at Tschechnitz, near Breslau, was 88 per cent., an excess of 12 and 10 per cent. over the corresponding periods in 1931 and 1930, respectively. On several occasions, especially from 20th to 22nd, the relative humidity reached 100 per cent., the weather was sultry, with heavy showers at intervals, very cool nights, and extensive dew formation—all factors contributing to the spread of the disease. It was again observed that wheat following clover or other legumes is much more liable to black rust than when it succeeds beets. Some general directions are given for the reduction of infection by suitable cultural practices, and attention is drawn to

the work now in progress by experts on the breeding of rust-resistant varieties.

PEKLO (J.). **L'état actuel de la lutte contre les rouilles chez les céréales en Tchécoslovaquie.** [The present state of the control of cereal rusts in Czecho-Slovakia.]—*Deuxième Congr. Internat. de Path. Comp.*, Paris, II, *Comptes rendus et Communications*, pp. 501–506, 1932.

After referring to the heavy losses caused by yellow rust of wheat (*Puccinia glumarum*) in Czecho-Slovakia [*R.A.M.*, iii, p. 209; vi, pp. 213, 345], the author states that in 1913 he began to cross hard, susceptible varieties with soft, resistant ones, using, among others, Kubanka, several winter wheats from the Hungarian-Slovakian region, and some Svalöf autumn wheats among which were varieties very resistant to yellow rust. From crosses so made between strongly and weakly resistant, and between two moderately resistant varieties, segregations were obtained which showed high resistance to *P. glumarum* in addition to heavy yield, resistance to lodging, and other desirable qualities. Evidence was obtained that, as regards lines almost but not quite homozygous for resistance, when resistance though very strong initially became slightly reduced in the first generations, there might be a severe development of rust in the following generations. Owing to the few genetic factors conditioning resistance, a very slight lack of original resistance could, through secondary segregations ('Nebenspaltungen'), conduce in the next two or three generations to a very pronounced want of resistance.

During the first ten years valuable segregations were obtained, including lines from a series in which the parents were a Czech 'alternative' wheat and a Svalöf autumn wheat and lines from another series of crosses between Kubanka and another Svalöf autumn wheat. The best lines from the two series were then combined so that the resultant hybrids had the Czech alternative wheat and Kubanka as grain quality parents and both Svalöf autumn wheats as high yielding parents. The first generations of the new hybrids showed better qualities than either series of parents; their development was vigorous, rust resistance strongly marked, and the grain was red, hard, and fine and weighed 80 kg. or more per hectol. In 1931 the yield was 32 quintals per hect. in large-scale tests.

PELTIER (G. L.). **Relation of weather to the prevalence of Wheat stem rust in Nebraska.**—*Journ. Agric. Res.*, xlvi, 1, pp. 59–73, 1933.

Continuing his studies of the epidemiology of wheat stem rust (*Puccinia graminis tritici*) in Nebraska [*R.A.M.*, vii, p. 623], the author states that an examination of the time of heading and length of the ripening period of wheat during 28 consecutive years showed that in the eastern part of the State epidemics of black rust did not occur when winter wheat headed prior to, or in the first week of June, and matured before the first of July. In years when the fruiting period was prolonged, incipient epidemics were frequently checked by local ecological factors, among which low

temperatures are apparently a major limiting factor in the initiation of primary infection and in the subsequent development of the first uredosori, while the lack of an even distribution of relatively high precipitation is the major inhibiting factor in the development of subsequent generations of uredospores.

As indicated by a study from 1921 to 1930 of a number of factors influencing the development of the rust, an epidemic in the winter wheat area of Nebraska only occurs when a large amount of primary inoculum reaches the crop (mainly from overwintered uredospores from Texas successively multiplied as they travel northward) under conditions which favour maximum infection and development of primary uredosori, in years when the wheat enters the heading stage during the first week of June or later, the primary uredosori appearing at about the same time, and when there is an extended fruiting period during which optimum temperature, evenly distributed precipitation above the normal, and other favourable conditions promote the rapid development of the subsequent uredospore generations.

MACINDOE (S. L.). **Leaf rust of Wheat.**—*Agric. Gaz. New South Wales*, xliv, 1, pp. 35–39, 1933.

Throughout the Australian wheat belt, stem rust (*Puccinia graminis tritici*) is a much more important factor in reducing yield than is leaf rust (*P. triticina*) [*R.A.M.*, xi, p. 629], but the latter, by considerably reducing the water economy of the plant and rendering it less capable of taking full advantage of the available soil moisture, may depress the yield to a degree quite out of proportion to the apparent amount of infection. Leaf rust also accentuates moisture deficiency in a dry spring and therefore may account for much of the injury usually attributed to drought.

A list is given (arranged according to degree of resistance or susceptibility to leaf rust) of numerous wheat varieties grown for one to three years in experimental plots in New South Wales. A large group entirely free from leaf rust, while it includes none of economic value under local conditions, does, however, include Hope, some Marquis-Vernal emmer crosses from South Dakota (C. 5085, C. 5089, C. 5090, and C. 5084), and a Vernal emmer-Jumillo cross (C. 5083) from the same locality which are also highly resistant to stem rust.

Among many wheat varieties showing only a trace of leaf rust were durum wheats from different countries and very late maturing *vulgare* wheats mostly of European origin. Of these the only one of agronomic worth was the Farrer variety Thew, now seldom grown in Australia. None of the varieties showing light infection (10 per cent.) are recommended for commercial planting in New South Wales. Moderate infection (25 per cent.) was shown by the New South Wales wheats Burrill, Canimbla, Cedar, Clarendon, Florence, Firbank, Genoa, Jonathan, and Warren; by the Victorian wheats Cowman, Cowhort, Fedtal, Flamen, Minflor, Wardfir, and Whillan; by the Western Australian wheats Geeralying, Nabawa, and Sutton; and by Pusa 4, which is grown widely in Queensland and to some extent in New South Wales.

ALLEN (RUTH F.). **Heterothallism in Puccinia graminis, P. coronata, and Melampsora lini.**—Abs. in *Phytopath.*, xxiii, 1, p. 4, 1933.

The observations on heterothallism in *Puccinia graminis* and *P. coronata* [*P. lolii*] in this abstract have already been noticed from other sources [*R.A.M.*, x, p. 168 ; xii, p. 164].

Flax rust (*Melampsora lini*) has also been found to be heterothallic. The isolated unisexual infection bears no aecidiospores. Fertilization may occur in 8- to 20-day old infections, rarely older. Cells of the gametophytic, vegetative mycelium contain one to four nuclei. The young spermogonium centres on a stoma and at first uses the stomatal aperture as an ostiole. At this time no hyphae reach the leaf surface except at spermogonia. Cell fusions occur regularly in the aecidium.

MAINS (E. B.). **Host specialization of Erysiphe graminis tritici.** —*Proc. Nat. Acad. Sci.*, xix, 1, pp. 49–53, 1933.

Most of the varieties of *Triticum vulgare* wheats tested in 1924, 1929, and 1930 at Purdue University, Indiana, and in 1931 at Michigan University for reaction to physiologic form 1 of *Erysiphe graminis tritici* [*R.A.M.*, xii, p. 78] proved to be susceptible. Among them may be mentioned Fulcaster, Harvest Queen, Illini Chief, Kanred, Marquis, Minhardi, Turkey, and Velvet Chaff. A high degree of resistance, however, was shown by Axminister (C. I. 1839), Chul (C. I. 2277), Dixon (C. I. 6295), Erivan (C. I. 2397), Huron (C. I. 3315), Norka (C. I. 4377), and several selections of Illinois No. 1 (35, 47, and 59). Michigan Amber and a few other varieties showed marked fluctuations in their reaction to the fungus, being susceptible in some tests and resistant in others.

The club wheats (*T. compactum*) were mostly very susceptible, but one unnamed strain (No. 830) was very resistant in 1929, and three moderately so.

Most of the spelts (*T. spelta*) and durums (*T. durum*) were susceptible, among the latter being Acme, Arnautka, Kubanka, Mindum, Monad, and Pentad. Susceptibility also characterized most of the poulards (*T. turgidum*), except No. 820, and the Polish wheats (*T. polonicum*).

On the other hand, pronounced resistance was exhibited by most of the emmers, e.g., Khapli (C. I. 4013), Vernal (C. I. 1524), White Spring (S. D. 293), and Yaroslav (C. I. 1526), and also by the einkorns (*T. monococcum*), *T. dicoccoides*, *T. persicum*, and *T. timophevii*, while *T. stramineum* gave variable results. A number of wild grasses also proved very resistant, including *Agrostis alba*, *Agropyron repens*, *Arrhenatherum elatius*, *Bromus* spp. (7), *Festuca elatior* and *F. rubra*, *Elymus canadensis*, *Hordeum jubatum*, and *H. murinum*.

Physiologic form 2, isolated near Ann Arbor in the winter of 1932, causes heavy infection on Axminister and Norka, which are resistant to form 1. Most of the other 300 wheats inoculated with form 2 showed similar reactions to those obtained with form 1. Rye was apparently immune from this form.

FARIS (J. A.). **Influence of soil moisture and soil temperature on infection of Wheat by Urocystis tritici.**—Abs. in *Phytopath.*, xxiii, 1, pp. 10–11, 1933.

In inoculation experiments under controlled conditions with flag smut (*Urocystis tritici*) spores on Harvest Queen wheat [*R.A.M.*, ix, p. 167], a high percentage of infection was secured between 10° and 20° C. with fairly dry soil during the germination of the wheat. With a soil moisture of 40 per cent. (the best for sowing wheat), high infection occurred only when the seed-grain was germinated at a temperature of 10° to 15°. With a soil moisture approaching saturation (60 per cent.), extensive infection occurred at 10° while above or below this point there was a rapid drop in the percentages.

CHEN (H. K.), HWANG (L.), & YU (T. F.). **Experiments in controlling flag smut of Wheat.** [? Reprinted from *Nanking Journ.*, ii, pp. 401–414, 2 figs., 1932. Chinese, with English summary.]

Flag smut of wheat [*Urocystis tritici*] is stated to be particularly injurious in the vicinity of Nanking [*R.A.M.*, xi, p. 290], where the seedlings generally become infected either by spores on the seed or by those in the soil. Adequate control of the disease was given by höchst, uspulun, and tillantin B dusts [ibid., x, p. 371], none of which, however, completely eliminated infection. Several native and foreign varieties have been found to show a high degree of resistance to flag smut, verging on immunity, and their development is recommended as the most practical and efficient method of control. Crop rotation should be combined with seed treatment in order to remove one of the chief sources of infection, namely, the smut spores remaining in the field.

MEAD (H. W.). **Studies of methods for the isolation of fungi from Wheat roots and kernels.**—*Scient. Agric.*, xiii, 5, pp. 304–312, 1 pl., 5 graphs, 1933. [French summary on p. 345.]

Brief details are given of sixteen methods which were tested by the author for the surface sterilization of wheat roots and grains for the purpose of isolating organisms present within the tissues. The most consistently good results were obtained by Simmond's 'washer' method [*R.A.M.*, x, p. 257], which also permitted the handling of large quantities of material. In some cases saponin solutions and alcohol were used to wet the material prior to washing, and while alcohol usually somewhat reduced the growth of the fungi isolated, the saponin solutions for the most part encouraged their growth. Soaking in hydrogen peroxide for 20 minutes, followed by rinsing in sterile water, gave a good growth of the fungi from roots and grains, but the original strength of the solution was difficult to maintain. The same length of treatment in freshly made calcium hypochlorite solution was satisfactory with roots, but was not long enough to give complete surface sterilization of the grain. Mercuric chloride in water or alcohol was somewhat toxic to both the external and internal fungi of roots and grains, but gave effective sterilization of the latter, and did not injure their viability. One-hundredth normal silver nitrate

solution was found to be of no use for the purpose of isolation, but it proved very satisfactory for the preparation of sterile wheat seedlings.

Fraser (W. P.) & Ledingham (G. A.). **Studies of the crown rust, Puccinia coronata Corda.**—*Scient. Agric.*, xiii, 5, pp. 313–323, 1 pl., 1933. [French summary on p. 345.]

As a result of their investigation of the occurrence of crown rust (*Puccinia coronata*) [*P. lolii*] in the prairie provinces of Canada and of extensive cross-inoculation experiments [the results of which are presented in eight tables] from 1925 to 1927, inclusive, the authors distinguish four different varieties of the fungus, namely, *avenae* with its aecidial stage on *Rhamnus cathartica*, and uredo and teleuto stages on cultivated species of oats and on *Avena fatua*; *calamagrostis* with its various stages on *R. alnifolia*, and on species of *Calamagrostis* and *Scolochloa festucacea*, respectively; *bromi* with aecidia on *Lepargyraea canadensis*, and the other stages chiefly on *Bromus ciliatus, B. latiglumis*, and *B. porteri*; and *elaeagni* on *Elaeagnus commutata* and a form or variety of *C. elongata*, respectively. The differentiation of these four varieties rests chiefly on the relationship of the aecidial hosts and on some morphological characters of the aecidia, while a statistical analysis of the size of the various types of spores showed no significant differences between them.

Holbert (J. R.), Elliott (Charlotte), & Koehler (B.). **Bacterial leaf blight of Dent Corn.**—Abs. in *Phytopath.*, xxiii, 1, pp. 15–16, 1933.

Bacterial leaf blight (wilt) of maize [*Aplanobacter stewarti*: *R.A.M.*, xii, p. 281] caused a loss of green leaf area, directly traceable to local bacterial infection, of up to over 50 per cent., with an average of 16·6 per cent., in the 66 fields surveyed in Illinois in 1932. The general appearance of the affected plants in the middle of August in some cases recalled that due to severe heat and drought. In most of the isolations the causal organism present in the leaf lesions did not occur in the same leaf veins farther down the lamina or in the sheath or bundles of the stalk below the infected leaf. Differences in strains of the pathogen were noted. The reduction in leaf area apparently increased susceptibility to stalk rot (*Diplodia*) [*zeae*] and chilling injury, besides decreasing the breaking resistance of stalks and total yield and quality of grain. Marked differences in reaction to wilt were shown by the various inbred strains and their crosses.

Ivanoff (S. S.). **Bacterial wilt of Corn.**—Abs. in *Phytopath.*, xxiii, 1, p. 18, 1933.

The western maize root worm (the larval stage of *Diabrotica longicornis*) has been found to act as a vector of Stewart's wilt disease of maize (*Aplanobacter stewarti*) [see preceding abstract]. After feeding on the roots of diseased plants, the larvae repeatedly transmitted infection when placed on the roots of healthy plants in the greenhouse. Several bacteria differing in various respects from *A. stewarti* were isolated from wilted plants. Inoculations

with these organisms on yellow Dent and sweet maize caused symptoms of varying severity in individual plants and produced different percentages of disease.

HOOVER (M. M.). **Inheritance studies of the reaction of selfed lines of Maize to smut (Ustilago zeae).**—*West Virginia Agric. Exper. Stat. Bull.* 253, 32 pp., 1932.

A fully detailed and tabulated account is given of the writer's studies, covering a period of ten years in West Virginia, on the factors governing the inheritance of smut (*Ustilago zeae*) in over 200 selfed lines of maize [*R.A.M.*, xii, p. 88] grown under conditions favouring epidemics of the disease.

Crosses between selfed lines of maize characterized by well-marked differences in regard to the place and amount of smut infection showed clearly that reaction to *U. zeae* is a host strain peculiarity transmissible from parent to offspring. Crosses between West Virginia selfed lines and certain 'linkage testers' (representatives of different genetic groups as classified by R. A. Emerson) indicated that at least four testers show a linkage relation with smut susceptibility. Thus, in group IV, characterized by the absence of ligules round the main stalk, most of the infection was found in the basal regions of the plant. The brachytic factor in group VI causes a marked shortening of the internodes; when the ear shoots appear the leaf sheaths are ruptured and afford a good focus for the infection of the inner meristematic tissue. Most of the plants in this group were attacked on or below the ear. The 'ramosa' group (VII) shows excessive branching of the ear, which causes the rupture of the protective husks and exposes the young spikelets. In over 95 per cent. of the plants comprising this group smut occurred in the ear. The 'ramosa' type plants obtained from the yellow and white resistant West Virginia strains crossed with members of the 'ramosa' group showed 93·6 and 82·1 per cent. infection, respectively, indicating that, at any rate in this cross, the gross morphology of the plant is a more important factor in smut reaction than parental resistance on one side. Group VIII was represented by the virescent #2 tester and by certain plants of the 'brevis' type, characterized by partial curtailment of the internodes. The F_1 plants as well as the back cross and F_2 progeny of the virescent #2 tester showed marked resistance to smut, possibly correlated with late maturity and general weakness. On the other hand, the 'brevis' progeny showed a high degree of susceptibility, correlated with the exposure of the tissues through the twisting of the culms and rupture of the leaf sheaths. The progeny of crosses between the crinkly dwarf 1-tassel seed #4 tester (group IX) and the susceptible local 'base' strain showed nearly 100 per cent. infection, due to the exposure of a mass of silks and seed in the tassel (a feature of the group) soon after emergence. Some decrease of infection (though the incidence remained high) resulted from the crossing of this 'tester' with the resistant West Virginia strains. The F_3 generation of a cross between the yellow and white resistant local strains is composed of a highly resistant population showing considerable promise as foundation stock for further breeding work.

It may be inferred from these data that reaction to *U. zeae* is conditioned by two sets of factors, one controlling the physiological behaviour and the other the morphological characters of the host plant.

EDDINS (A. H.) & VOORHEES (R. K.). **Physalospora on Corn and its taxonomic and host relationships.**—*Phytopath.*, xxiii, 1, pp. 63–72, 2 figs., 1933.

Physalospora zeicola, found on maize stalks in Florida producing an ear-rot similar to that caused by *Diplodia frumenti*, has been shown to be the perfect stage of the latter fungus [*R.A.M.*, x, p. 96; xi, p. 771]. Inoculation experiments on green maize stalks with the mycelium from pure ascospore cultures of *P. zeicola* resulted in a blackening of the pith and epidermis. Three of the five cultures formed the perfect stage on some stalks and the imperfect on others, while two developed the latter only; the perithecia, asci, and ascospores agreed with those of *P. zeicola*, and the pycnidia and pycnospores with those of *D. frumenti*. Similar tests on ears in the early milk stage resulted in the extensive rotting and blackening typical of infection by *D. frumenti*, both pycnidia and perithecia being formed.

The Florida form of *P. zeicola* is characterized by longer asci than the type species (95 to 140 by 10 to 13 compared with 75 to 80 by 12 to 15 μ). The average dimensions of the pycnospores of the Florida fungus from artificially inoculated stalks and from culture were 25 to 27 by 12 to 13 and 26 to 28 by 13 to 14 μ, respectively.

Since Stevens has shown that *P. rhodina* is the perfect stage of *D. natalensis* and *D. gossypina* [ibid., vi, p. 127], it would, in the authors' opinion, be less confusing to refer to this fungus by its perfect stage name than to call it *D. natalensis* on citrus and *D. gossypina* on cotton. The ascospores of *P. zeicola* are shorter and narrower than those of *P. rhodina* (13 to 27 by 6 to 11 μ, mostly 20 to 23 by 8 to 9 μ, as compared with 24 to 42 by 7 to 17 μ, mostly 30 to 35 by 11 to 14 μ). *P. zeae*, according to Stout [ibid., x, p. 305], differs from *P. zeicola* in its larger asci (85 to 150 by 13 to 22 μ) and longer but narrow spores (19 to 25 by 6·5 to 8 μ).

Inoculation experiments with *P. zeicola* showed that the fungus was most virulent on young ears. Under natural conditions maize ears are more liable to infection by *P. zeicola* at the butt than at the tip.

P. zeicola, *P. rhodina*, and *D. tubericola* (which can cause similar symptoms on maize) [ibid., x, p. 96] grew and formed pycnidia on 31 plants inoculated in the branches, stems, or other parts with mycelium from pycnospore cultures of the three organisms. Among these hosts may be mentioned peach, fig, sweet potato, watermelon, *Ricinus communis*, avocado pear, cotton, *Carica papaya*, orange, grapefruit, and mango. These studies indicate the need for a reclassification of Saccardo's list of *Diplodia* species, since it may be that many others of similar morphological relationships will have the same host range.

Ajrekar (S. L.) & Likhite (V. N.). **Observations on Tolyposporium penicillariae Bref. (the Bajri smut fungus.)**—*Current Science*, i, 7, p. 215, 1933.

The authors state that studies carried out at Ahmedabad and Baroda on *Tolyposporium penicillariae* [*Ustilago penniseti*: *R.A.M.*, x, p. 625], the causal organism of smut on bajri (*Pennisetum typhoideum*) in Gujarat, show that the fungus is readily cultivable by sowing spore balls on maize, *P. typhoideum*, or jowar [sorghum] meal agar, and on boiled potato or carrot. The growth on these media consists almost entirely of budding sporidia.

Infection takes place, as in wheat, at the flowering stage of the host, but no dormant mycelium is formed in the grains by *U. penniseti*, infection being followed about a fortnight after inoculation by spore-ball production. The fungus occupies the space between the pericarp and the aleurone layer of the grain, and forms its spore balls after gradually exhausting the starchy endosperm. In the early stages of infection the grains contain a characteristic white mycelium. No resting period is required for the germination of the spore balls, at any rate on artificial media; natural germination of these organs has not been observed. *U. penniseti* is not amenable to control by seed treatment with copper sulphate, and none of the common varieties of *P. typhoideum* is immune from the disease.

Hungerford (C. W.) & Remsberg (Ruth). **Sclerotium diseases of grains and grasses.**—Abs. in *Phytopath.*, xxiii, 1, p. 17, 1933.

Fourteen cultures were obtained of sclerotial fungi of widespread occurrence on grains and grasses in the mountainous regions of Idaho. The optimum temperature for the organisms, which appear after the snow melts, ranges from 0° to 10° C. One of the four groups to which the fungi under observation have been assigned corresponds to a culture of *Typhula graminum* supplied by H. Tasugi from Japan [*R.A.M.*, ix, p. 709]. The pathogenicity of several of the organisms was demonstrated by laboratory and field tests. Late sowing and the use of resistant varieties appear to be effective against *T. graminum*.

Guiscafré (J. R.). **The brown rot fungus in Puerto Rico.**—*Journ. Dept. Agric. Puerto Rico*, xvi, 2, pp. 193–202, 2 pl. 1932. [Received April, 1933.]

In giving a brief account of brown rot gummosis (*Phytophthora citrophthora*) of citrus trees [*R.A.M.*, xii, p. 89], the author states that in Porto Rico the disease was recorded for the first time in 1931 in citrus groves at the Eugenia plantation, near the town of Añasco. A survey has shown that many areas there are seriously affected, while in others the young trees that were planted to replace dead ones are also diseased and produce coarse, discoloured, sour or insipid fruit, unfit for the market. It is pointed out that in the plantation conditions are very favourable for the development of the disease; the annual rainfall is from 70 to 80 inches, the water table is often found at 1 to 1½ feet below the surface, and the trees are budded low.

Fawcett (H. S.). **Prevention of brown rot gummosis on young Citrus trees.**—*California Citrograph*, xviii, 3, p. 84, 1933.

After pointing out that under Californian conditions it is impossible in practice to separate the brown rot gummosis of citrus caused by *Phytophthora citrophthora* [*R.A.M.*, xi, p. 212 and preceding abstract] from that caused by *P. parasitica*, the author states that common lemon and sweet orange are both susceptible, the latter, however, much less so, as a rule, than the former. Rough lemon and sour orange [*Citrus aurantium* var. *bigaradia*] under most conditions are almost immune [cf. ibid., x, p. 98]. As the present tendency is to use more sweet orange stock in new plantings, prevention, especially on young trees, calls for all the more attention.

The most critical period appears to be the first year in the orchard, when it is difficult in California to start newly set trees without running water next to the trunks. The trees should be planted at such a height that after settling they are at least as high as they were in the nursery. In using any susceptible rootstock the bark at the base down to the first main roots should be protected with Bordeaux paste, spray, or powder, about one-fifth of an ounce of the last-named being shaken on to the trunk and round it to a diameter of two or three inches just after planting and before the first irrigation. As the trees grow older the amount of Bordeaux powder used may be gradually increased until one ounce or more is used on trees not under ten years old. As soon as possible during the second year and after, growers should begin to keep the water away from the trunks.

The paper concludes with a brief description of the usual Californian treatment for affected trees. Once young trees are affected, whether or not treatment will prove worth while depends entirely upon the severity of the infection.

Reichert (I.). **A new root rot of Citrus trees in Palestine.**—Reprinted from *Hadar*, v, 11, 8 pp., 3 figs., 1932.

Citrus trees in Samaria, Palestine, were attacked in 1931 by a root rot associated with a fungus of uncertain identity which caused a yellowing, wilting, and eventual desiccation of the leaves, dying-back of the branches, and a white rot of the roots and collar. White and brownish hyphae were found in the bark, wood, and pith of the roots, and a whitish mat of mycelium with fan-like margins covered their surface. On potato agar the mycelium was composed of hyphae measuring 1 to 4 μ in diameter and bearing spherical or irregular chlamydospores; clamp-connexions were also observed.

Certain features of this organism agree with *Armillaria mellea*, but the absence of rhizomorphs and the chlamydospore formation are against this suggestion. The latter are reminiscent of those produced by the 'phthiriose' organism of Mangin and Viala, regarded by the author as a *Polyporus*.

The affected trees were two years old and only those budded on sweet lemon were diseased. Oak and eucalyptus props supporting the trees were also infected, though to a lesser extent than the chestnut props.

Recommendations are given for the eradication of the diseased trees and trenching the infected sites.

CHAUDHURI (H.) & SINGH (G.). **The wither-tip disease of Citrus plants. Part I.**—*Journ. & Proc., Asiatic Soc. of Bengal* (N.S.), xxvi, 4, pp. 523–532, 3 pl. (1 col.), 1933.

Nearly all kinds of citrus throughout India have been found by the writers liable to infection by *Colletotrichum gloeosporioides*, the causal organism of wither-tip [*R.A.M.*, ix, p. 64]. In Lahore the fungus was observed on the lime, lemon, pomelo, and on the Malta orange, mostly confined to the twigs, though the leaves were occasionally affected. Nursery plants in the Lawrence Gardens showed the first symptoms of infection early in February, when the newly attacked apical portions lost their leaves and assumed an ashen tint; black acervuli developed later on the affected areas. The disease was more severe on lemons and sour limes than on oranges (including the Malta) and sweet limes. Recently a number of cases were observed in which immature and young fruits dropped as a result of infection by *C. gloeosporioides*. The twigs are often killed back four or five inches, and older branches may also suffer from the attacks of the parasite.

The wither-tip fungus was isolated from a Malta orange twig collected in October, 1928. The mean length of the spores in culture ranged from 12·2 on Czapek's medium to 15·8 μ on prune agar, and the mean breadth from 2·2 to 5·7 μ (maize and potato glucose, respectively). On the host the average size of the spores is 12·9 by 5·7 (extremes 8·5 to 21 by 3 to 7·5 μ) and there is a considerable variation both in size and shape even in the same acervulus. The spore dimensions were found to decrease from lower to higher concentrations of Czapek's medium. The temperature range for the growth of the fungus was found to extend from 15° to 35°, with an optimum between 21° and 25° C. The thermal death point lies between 65° and 66° (ten minutes' exposure). Of a large number of isolations, only three showed slight differences in spore dimensions and might possibly be distinct strains; two were isolated from *Citrus acida* [*C. medica* var.] and one from lemon. In numerous cross-inoculation tests each strain infected all the other hosts.

In laboratory inoculation experiments, the young, tender parts were first attacked. In 1929 heavy losses occurred among citrus plants in the Punjab owing to the intense cold of late January and early February, which so weakened the tissues that *C. gloeosporioides* readily gained entrance; all the seedlings in the Lawrence Gardens were thus killed.

REGUERAL (F. G.). **La foliocelosis o veteado de las hojas del Naranjo.** [The foliocellosis or mottling of Orange leaves.]—*Bol. Pat. Veg. y Ent. Agric.*, vi (*1931*), 23–26, pp. 58–68, 4 figs., 1932.

An account is given of the disturbance known as foliocellosis or mottling of orange leaves [*R.A.M.*, xi, p. 26], which is stated to be prevalent in Valencia, Spain. The condition is characterized by chlorosis of the secondary veins, elongation of the leaves, and

general stunting of the branches. The so-called 'media puncha' ['half thorn'] variety seems to be particularly susceptible to foliocellosis, while the 'vernia' is more resistant, and Washington Navel shows the effects comparatively little owing to its vigorous and luxuriant habit of growth. A considerable reduction of yield may result from foliocellosis. Most of the Valencian soils are deficient in lime, containing only 4 to 6 or even as little as 0·5 per cent., and the application of calcium is therefore recommended (calcium carbonate or lime at the rate of 10,000 kg. per hect. for the former and 4,000 to 5,000 kg. for the latter every 5 to 6 years, or 1,000 kg. gypsum every 3 years).

HESSELTINE (H. C.). **Diabetic or mycotic vulvovaginitis. Preliminary report.**—*Journ. Amer. Med. Assoc.*, c, 3, pp. 177–178, 1933.

Evidence is presented showing that yeasts (including *Saccharomyces*, *Cryptococcus*, *Endomyces*, and *Monilia* spp.) are etiologically associated with the development of vulvovaginitis in diabetic patients [cf. *R.A.M.*, ix, p. 311]. *Endomyces* was the most frequent in the restricted series of cases examined.

WILSON (S. J.), HULSEY (S.), & WEIDMAN (F. D.). **Chromoblastomycosis in Texas.**—*Arch. of Dermatol.*, xxvii, 1, pp. 107–122, 5 figs., 1933.

An account is given of an extensive verrucosis of the leg, of forty years' duration, in a Texas farmer. The fungus isolated from the lesions was identified as *Phialophora verrucosa* [*R.A.M.*, xi, p. 645], of which there is stated to be only one other authenticated case in the literature (*Journ. Cutan. Dis.*, xxxiii, p. 840, 1915). It is characterized by a light brown, beaded mycelium with short segments up to 3 μ in diameter; lateral or terminal phialides measuring 8 by 2·5 μ, generally surmounted by a minute empty cup but occasionally by a small conidium; and smooth, hyaline conidia, 2 to 2·5 by 1 to 1·5 μ. A species of *Alternaria* was recovered from a rat inoculated with *P. verrucosa* and is believed to be genetically connected with the latter. The colonies of *P. verrucosa* on Sabouraud's agar are slaty to coal-black and very superficial. Some comparisons are drawn between the case under discussion and Gilchrist's blastomycosis [ibid., xi, p. 643].

ELLIS (D.). **The incidence of asthma in Port Sudan, with special reference to the influence of moulds.**—*Guy's Hospital Repts.*, lxxxiii, 1, pp. 102–111, 3 graphs, 1933.

Of the 50 cases of acute asthma investigated by the writer at Port Sudan, 43 developed the disease for the first time after coming to the town, indicating the existence of some asthmogenic factor in the locality. Climate was the first to be considered and it was ascertained that 44 of the patients suffered the most severe paroxysms in the winter. No correlation could be detected between the incidence of asthma and the factors of soil, vegetation, and dust.

On a damp December day ten Petri dishes were filled with a medium of agar and 10 per cent. glucose, sterilized, and exposed

to the atmosphere for nine hours, after which they were covered and five placed in the ice chest and five in the incubator. After three days well-developed colonies of *Aspergillus niger* and *Penicillium glaucum* were observed, 14 or 15 on each plate, those on ice being larger and growing more rapidly. When the experiments were repeated on a relatively dry, hot day in July, only one or two colonies were obtained among all the plates exposed.

A concentrated emulsion, prepared from living spores of *P. glaucum* (which was found to give more definite reactions than *A. niger*) was injected through epidermal scratches into two of the patients, each of whom developed violent asthmatic and local symptoms within half an hour. In subsequent tests one minim of the standardized mould-containing fluid was injected intradermally on the outer side of the right arm, one minim of the saline solution used for dilution being simultaneously injected into the outer side of the left arm. Numerous control experiments were similarly conducted on normal persons as well as on those suffering from various pathological conditions, none of whom developed positive reactions. All but two of the asthmatic patients, on the other hand, experienced more or less pronounced reactions. Attempts to isolate the fungus from the sputa gave negative results.

Treatment by a process of desensitization has been instituted in Port Sudan, and so far the outcome has been very satisfactory, both with English people and natives. The injections have been started with single minim doses of the standard suspension and gradually increased to ten minims, the latter dose being applied weekly until the attacks cease. No adverse effects have followed the use of live cultures, and the efficacy of dead ones has not yet been determined.

Falchi (G.). **The action of chemical substances on mycetes causing dermatomycosis.**—*Boll. Soc. Ital. Biol. Sper.*, vii, pp. 1352–1357, 1932. (Italian.) [Abs. in *Chem. Abstracts*, xxvii, 6, pp. 1404–1405, 1933.]

The action of methyl violet, crystal violet, gentian violet, malachite green, methylene violet, and safranin on the cultural development of *Trichophyton*, *Achorion*, and *Microsporon* spp. was studied. Gentian violet and malachite green were the most effective in preventing growth, closely followed by methylene and crystal violet [*R.A.M.*, xi, p. 716]. *A. schoenleini* and *T. violaceum* were the most sensitive of the organisms tested.

Jungherr (E. L.). **Observations on a severe outbreak of mycosis in chicks.**—*Journ. Agric. Res.*, xlvi, 2, pp. 169–178, 3 figs., 2 graphs, 1933.

Details are given of a severe outbreak in 1931 of thrush in a commercial chicken hatchery in Connecticut, which out of a population of 50,000 killed 10,000 under the age of 60 days. The lesions, which are described and involved practically the whole of the digestive tract, on isolation yielded three yeast-like fungi resembling *Monilia* [*Candida*] *albicans* [*R.A.M.*, xii, p. 172], *M.* [*C.*] *krusei* [ibid., xi, p. 645], and *Oidium* [*Oospora*] *lactis* [ibid., xi, p. 743]. The symptoms of the disease were reproduced by feeding

the chickens' faecal material from diseased individuals, and by injecting cultures of the *C. albicans* type; only two cases of death resulted from injections with the *O. lactis* type of organism. There was circumstantial evidence that the disease is transmissible through the agency of the eggs, and it is presumably carried on the surface of the latter. As far as the author is aware, this is the first record of an outbreak of thrush of major epidemiological importance in chickens.

SAVAGE (A.) & ISA (J. M.). **A note on mycotic pneumonia of chickens.**—*Scient. Agric.*, xiii, 5, p. 341, 1 fig., 1933. [French summary on p. 346.]

The cause of an epidemic outbreak of pneumonia due to *Aspergillus fumigatus* [*R.A.M.*, xi, p. 715; xii, p. 271] which in 1932 killed over 90 per cent. of a brood of 400 chickens near Winnipeg, was traced to the heavy infection with the fungus of dry maize ensilage which had been used as litter for the chickens.

DE JONGE (L. J. A.). **Plantenziektenkundige vraagstukken in verband met de Vlascultuur.** [Phytopathological problems in connexion with Flax culture.]—*Tijdschr. over Plantenziekten*, xxxix, 1, pp. 1–10, 1933.

An account is given in general terms of the principal flax diseases and their geographical distribution in Holland and elsewhere, viz., wilt (*Fusarium lini*), canker (*Colletotrichum linicolum*) [*C. lini*: *R.A.M.*, xii, p. 220], *Botrytis* disease (*B. cinerea* f. *lini*) [ibid., ix, p. 246], scorch (*Pythium megalacanthum*) [ibid., xi, p. 578], and the *Phoma* disease (*P. exigua*) [ibid., xi, p. 25]. Attention is drawn to the great prevalence of rust (*Melampsora lini*) in the provinces of Groningen and Friesland and to its relative scarcity in Zeeland; the blue-flowering varieties are by no means rust-immune, as is often stated in the literature, though less susceptible than the white ones. The latter (represented by Texala, Bella, and Excello) also appear to be susceptible to *P. exigua*.

NELSON (C. I.). **A method for determining the specificity of the intracellular globulin of Fusarium lini.**—*Journ. Agric. Res.*, xlvi, 2, pp. 183–187, 1933.

After a brief description of two methods which were evolved for the extraction of protein material from mycelial masses of *Fusarium lini* [*R.A.M.*, xii, p. 220], the author gives a few details of experiments on rabbits which showed that a protein fraction corresponding to globulin possesses antigenic properties to a higher degree than ground masses of mycelium. There also was evidence that the latter retained antigenic specificity in proportion as the method used in crushing and extracting its juice failed to remove the globulin. It is thought that it may be possible on further refinement of the methods to use them for the purpose of determining by serological tests the interrelationships of the physiological strains of *F. lini* to which the varying reactions of resistant flax varieties in different localities have been attributed [ibid., vi, p. 294].

AGGÉRY (Mlle B.). **Sur une nouvelle espèce de Gloeosporium parasite du Scolopendre et sur sa biologie.** [On a new species of *Gloeosporium* parasitic on *Scolopendrium* and on its biology.]—*Comptes rendus Soc. de Biol.*, cxii, 3, pp. 258–260, 1933.

Leaves of the hart's-tongue fern, *Scolopendrium vulgare*, in the eastern Pyrenees and at the Toulouse Botanical Garden were observed in 1931 to bear circular, brown spots, 3 to 15 mm. in diameter, from which was isolated a species of *Gloeosporium* regarded as new and named *G. nicolai*.

The fungus [a Latin diagnosis of which is given] is characterized by intercellular, sparsely branched hyphae, 3 to 8 μ in width, penetration being effected by means of an infection hypha from a terminal appressorium. The hypophyllous acervuli are reddish, subcutaneous, 53·5 to 214 by 110 to 480 μ, and the hyaline, oval, cylindrical, or piriform, simple, thick-walled conidia, 32 to 54 by 16 to 22 μ, are extruded in a small, white, glistening cirrhus.

CURZI (M.). **Su una clorosi maculata della Rosa.** [On a spotted chlorosis of Rose.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 4, pp. 365–376, 1 pl., 2 figs., 1932.

Brunner roses growing in the open and under glass at San Remo, developed, shortly before flowering, a yellow leaf spot which later became very marked though the plants in all other respects remained normal. Grafting shoots from diseased roses on to healthy ones gave negative results, and affected roses removed to other soils did not show the spotting on the new growth. The soil on which the plants were growing had a P_H value of 8·4 to 8·6 with a lime content of 32 per cent. A short distance away, where the soil had a P_H value of 7·4 to 7·6 and a lime content of only 16 per cent., the same variety was quite healthy, as it was when grown in Rome in soil with a P_H value of 7·2 to 8·2.

The condition is regarded as a chlorosis due to soil alkalinity, to which Brunner roses appear to be particularly susceptible, aggravated by heavy applications of nitrate of soda in the place of organic manure, and the high marl content of the subsoil.

A bibliography of 23 titles is appended.

VOGLINO (P.). **Ricerche sulla Fusariosi degli Astri della Cina.** [Researches on *Fusarium* wilt of China Asters.]—Reprinted from *Ann. R. Accad. Agric. Torino*, lxxv (*1932*), 22 pp., 2 pl., 8 figs., 1933.

Describing the results obtained in three years of study of the *Fusarium* wilt of China asters (*Callistephus chinensis*) which in recent years has become progressively worse in Italy, where it now causes very heavy losses [*R.A.M.*, x, p. 775; xi, p. 375], the author states that the morphological characters [which are described] of the causal organism agree with those of *F. conglutinans* var. *callistephi*. The fusoid, falcate, acute, hyaline conidia are never continuous but almost invariably 3-septate, measuring 28 to 35 by 4·5 to 5 μ; very occasionally 4- to 5-septate conidia 50 μ long are produced. One of the most salient characters is the presence of

chlamydospores in chains. In culture these organs retained their germinative capacity for over a year. The fungus is thus distinct in its conidial characters from *F. conglutinans* var. *majus*, found on the stems of China asters in other countries [ibid., xii, p. 175]. It is also distinct from *F. conglutinans*, the cause of cabbage yellows, which has narrower conidia and no chains of chlamydospores. Inoculations of China asters, cabbages, and various other plants with pure cultures of *F. conglutinans* var. *callistephi* invariably gave positive results only on the first-named.

In Italy the disease becomes epidemic after transplanting and during flowering, when it is favoured by high temperatures; in cold weather it is less severe. Spread is due essentially to the abundant presence of chlamydospores in the soil, and is especially marked in those deficient in lime.

The early, European varieties, such as Penna di Struzzo, Queen of the Market, Comet Express, Hercules, and Unicum are susceptible, the late, American ones, known as Californica (Ramosa, Gigante, etc.) less so [cf. ibid., viii, p. 553; x, p. 227; xi, pp. 244, 302].

Preventive measures consist in disinfecting the soil (and liming copiously, if necessary) before planting, taking care not to injure the collar or roots during transplanting, immediately destroying affected plants, and spraying with 1 per cent. copper sulphate or 1 to 2 per cent. copper oxychloride. Asters must not be planted in soil already infested.

A bibliography of 14 titles is appended.

CREAGER (D. B.). **Fusarium basal rot of bulbous Iris.**—Abs. in *Phytopath.*, xxiii, 1, p. 7, 1933.

In the summer of 1929 the roots and bulbs of Spanish and Dutch irises on Long Island, New York, were found to be severely attacked by a species of *Fusarium* closely resembling *F. oxysporum*. The disease is very destructive to a number of commercial varieties, including Cajanus, Hart Nebrig, and Imperator. The fungus enters the roots and finally involves the basal plate and bulb scales. The inoculation of healthy bulbs with the fungus in moist chambers gave positive results, which also followed the planting of susceptible varieties in artificially infested soil.

BRIERLEY (P.). **Virus diseases of Dahlia.**—Abs. in *Phytopath.*, xxiii, 1, p. 6, 1933.

Dahlia mosaic [*R.A.M.*, x, p. 83] is stated to be prevalent in New York, New Jersey, Connecticut, and probably throughout the United States. Veinbanding is the most typical symptom, while dwarfing, leaf distortion, and vein necrosis may or may not be present. The virus has been transmitted by grafting and by *Myzus persicae*, the incubation period usually ranging from four to six weeks.

Ring spot of dahlias is characterized by zig-zag or ring markings in green shades, later becoming necrotic. It is transmissible by grafting, usually in combination with mosaic, from which it is not certainly distinct. A yellow variety of the disturbance is known only from Utah; this virus, also transmissible by grafting,

produces symptoms distinct from mosaic on two varieties. An oak-leaf pattern, apparently of virus origin, differs from all the above-mentioned types on one variety and from mosaic on another.

BORNMÜLLER (J.). **Die Scharlachkrankheit der Mahonia, Uropyxis mirabilissima P. Magnus.** [The scarlet disease of *Mahonia, Uropyxis mirabilissima* P. Magnus.]—*Mitt. Deutsch. Dendrol. Gesellsch., 1932*, xliv (*Jahrb.*), pp. 290–291, 1932.

A popular account is given of the occurrence and methods of dissemination of *Uropyxis* [*Puccinia*] *mirabilissima* on *Mahonia* [*Berberis*] *aquifolium* in Germany [*R.A.M.*, xii, p. 293].

KEUR (J. Y.). **Seed transmission of the virus causing variegation of Abutilon.**—Abs. in *Phytopath.*, xxiii, 1, p. 20, 1933.

The virus producing variegation in *Abutilon thompsoni* and *A. mulleri* [*R.A.M.*, xi, p. 592] was found to be transmissible to a limited extent to some of the seedlings obtained by crossing these two clones. Out of 536 seedlings arising from this cross 287 were green and 249 showed 'variegated' characters, which could only be transmitted in four cases to susceptible *A. regnellii* scions by grafting.

SIBILIA (C.). **Uno scopazzo su 'Daphniphyllum macropodium'.** [A witches' broom on *Daphniphyllum macropodium.*]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 4, pp. 395–404, 2 figs., 1932.

A 30-year old *Daphniphyllum macropodium* tree in the Botanical Gardens, Rome, showed the presence of a large witches' broom at least five to six years old and 2·5 to 3 m. high by nearly 1 m. broad. The basal branch of the broom was swollen and contorted, with numerous, closely packed, thin, negatively geotropic branches. Three or four years after the original formation of the broom, the only abnormal growth consisted in swellings at certain nodes, from which emerged numerous, rather thin branches, plagiotropic near the trunk and negatively geotropic only towards the tip. The leaves appeared to be normal. The oldest branches of the broom were dead.

The necrosed parts of the broom (which could not have been caused by mechanical injury or insect attack) contained a mycelium which in culture was white, later greyish-green. The fructifications, which were not found in nature, consisted of yellowish-red masses of thin, short, compacted conidiophores bearing the hyaline, ovate-elongated conidia of a *Gloeosporium*, only one species of which, *G. kawakamii*, appears to have been previously reported to cause witches' brooms [*R.A.M.*, vi, p. 233].

The mycelium had at first spread along the main branch of the broom, after which the only signs of pathological activity were the swellings on the main axis and a few prematurely dead or sickly lateral branches. Mycelium was not found in the healthy lateral branches, but was present in those that were swollen; the fungus was obtained from the bark and wood, but not from the leaves.

The morphology of the galls [which is described] was very

closely similar to that of others of the same general type [cf. ibid., iii, p. 481; vi, p. 706; x, p. 764].

A bibliography of 19 titles is appended.

ROSEN (H. R.) & BLEECKER (W. L.). **Comparative serological and pathological investigations of the fire-blight organism and a pathogenic, fluorescent group of bacteria.**—*Journ. Agric. Res.*, xlvi, 2, pp. 95–119, 1 pl., 5 figs., 1933.

After a brief account of the senior author's discovery in Arkansas of a bacterial disease (termed 'blast' in this paper) simulating, but distinct from, fireblight (*Bacillus amylovorus*) of apple and pear trees [*R.A.M.*, xi, p. 160], a detailed description is given of comparative serological and pathogenicity studies of the causal organism isolated from pears, and of *B. amylovorus* [ibid., xii, p. 225], *Phytomonas* [*Pseudomonas*] *citriputeale* [ibid., xii, p. 281], *P. syringae* [ibid., xi, p. 379], and *P. prunicola* [ibid., xii, p. 227], all of which are fluorescent pathogenic organisms. The results of the investigation showed that while the pear 'blast' bacterium gave no indication of relationship to *B. amylovorus*, it exhibited very close kinship to *P. syringae*, *P. prunicola*, and *P. citriputeale* both in its serological reactions and in the nature of the lesions it caused on pear twigs and leaves with or without wounding, and also on oranges and lemons on which *B. amylovorus* produced no infections. Cross-agglutination tests, in particular, showed that the pear blast, lilac blight, plum wilt, and citrus blast organisms are so closely related as to be indistinguishable from each other. From the published accounts of *P. cerasi* [ibid., xi, p. 311], *P. papulans* [ibid., x, p. 604], *P. nectarophila*, *P. barkeri*, and *P. utiformica* [ibid., xi, p. 379] it is believed that these organisms are also doubtfully distinct from the foregoing. For the present the authors accept the name *P. syringae* for this group of fluorescent bacterial pathogens.

In a discussion of the various methods hitherto used in the differentiation of bacterial species, it is contended that no useful purpose is served in erecting new species on the basis of a few cultural and physiological differences or on assumed host relationships, while the remarkable correlation shown in the present studies between pathogenicity and serological reactions of the organisms clearly demonstrates the value of the latter in determining the relationships of bacterial plant pathogens [cf. ibid., xi, p. 700].

On apples and pears *P. syringae* causes early spring infection of unopened blossom buds and an intense blackish discoloration of tissues along and between the veins of the leaves. It is typically a cool weather disease, becoming less prevalent as warm weather sets in. Young pear fruits are also naturally attacked and in artificial inoculations tender twigs were blighted. The incubation period is shorter than that of fireblight.

FRICKHINGER (H. W.). **Der Lagerschorf und seine Bekämpfung.** [Storage scab and its control.]—*Die Kranke Pflanze*, x, 1, pp. 6–8, 1933.

A popular account is given of late scab [*Venturia inaequalis*]

of stored apples and its control, based on recent German and Swiss investigations all of which have been noticed in this *Review* [*R.A.M.*, x, pp. 526, 801 ; xii, p. 32].

BIRMINGHAM (W. A.). **Another fungus attacking Apple stocks.**—*Agric. Gaz. New South Wales*, xliv, 1, pp. 58–60, 2 figs., 1933.

In April, 1932, some 50 per cent. of the Northern Spy apple stocks in a nursery in New South Wales were killed by *Sclerotium rolfsii* [*R.A.M.*, iv, p. 69]. The trees were attacked in groups and the symptoms resembled those due to drought, the foliage dying but not falling immediately. Infection occurred ½ to 2½ in. below soil level. The disease appeared towards early summer, was most severe as autumn approached, and became quiescent when cold weather set in. Thirty-six of the stocks obtained from this nursery were worked to Willie Sharp scions in an orchard at Dural, of which sixteen died and ten others subsequently became infected, while of nine adjacent Northern Spy stocks raised from old trees in the orchard, six died. The latter probably became infected during hoeing.

It is recommended that, before planting, stocks should be washed to remove any superficial fungal growth, and steeped for ten minutes in 1 in 320 formalin. If the soil is infected, freshly slaked lime should be harrowed in at the rate of 1 ton per acre, this being followed by drenching with copper sulphate (1 lb. to 7 galls. of water), or with mercuric chloride (4 oz. to 50 galls. water) applied at the rate of 1 gall. per sq. ft., or with ammoniacal copper carbonate (1 gall. per sq. ft.), using 5 oz. copper carbonate and 3 pints of ordinary strong ammonia to 50 galls. water. Frequent cultivation to dry the top soil creates conditions unfavourable to the growth of the fungus.

SARDIÑA (J. R.). **Acerca de la 'podredumbre verde' de las Manzanas.** [Concerning the 'green rot' of Apples.]—*Bol. Pat. Veg. y Ent. Agric.* vi (*1931*), 23–26, pp. 44–50, 4 figs., 1932.

Attention is drawn to the recent detection, in the Madrid market, of numerous cases of green rot of apples caused by *Penicillium crustaceum* [*R.A.M.*, x, p. 253], two types of which are recognized, viz., one characterized by a vitreous, water-soaked condition with no obvious traumatism, and the other by a small wound in the centre of the lesion. In a preliminary test some degree of control was achieved by the application to the fruit, before inoculation, of Bordeaux mixture with casein as an adhesive (1 kg. copper, 1 kg. lime, and 50 gm. casein per 100 l. water).

DAS GUPTA (S. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. III. On the pathogenicity of Cytosporina ludibunda, and its saltants.**—*Ann. of Botany*, xlvii, 185, pp. 197–226, 12 diags., 1933.

This is an account of the author's experiments from 1927 to 1929, inclusive, to test the rotting power on apples of certain of the saltants of *Cytosporina ludibunda* described in a previous communication [*R.A.M.*, ix, p. 547], as compared to that of the parent strain, the apple varieties used being Bramley's Seedling

and Worcester Pearmain. The rotting energy of the different strains was measured by the rate of radial advance of the fungus [ibid., vii, p. 585], and the results were tested by the usual statistical methods. Taken together, the evidence obtained indicated that the saltants may be conveniently divided into three groups, namely: I most active (more so than the parent), II moderately active, and III weak (comprising only one strain, CC_2), although under certain conditions the relative position in the groups of some saltants was interchanged. The rates of invasion varied considerably, the most active strain being from 20 to 50 times more active than the weakest (CC_2). It was further found that the rotting energy of the strains varied with the variety of apple and the age of the fruit, the indications being that the observed variations in the rate of radial advance were due to differences or changes in the resistance of the apples (probably conditions of chemical composition), rather than to modifications of the fungus. Some evidence also pointed to a differential effect of the season of growth of the apples (the 1928 season as compared with that of 1929) on the attacking power of the strains, but this point is not considered to have been conclusively established.

Berg (A.). **A fruit spot associated with the papular type of Apple measles.**—Abs. in *Phytopath.*, xxiii, 1, p. 4, 1933.

From several specimens of Grimes Golden apples at Purdue, Indiana, bearing numerous circular, nearly black fruit spots, a fungus was isolated agreeing in every respect with that causing the papular type of 'measles' on the wood [*Clasterosporium* sp.: *R.A.M.*, xi, p. 248]. Similar spots were produced by inoculation on the Rome variety, infection occurring through the lenticels.

Brooks (C.). **Spoilage of stone fruits on the market.**—*U.S. Dept. of Agric. Circ.* 253, 11 pp., 2 figs., 4 graphs, 1933.

A study of the car-lot inspection certificates of the United States Bureau of Agricultural Economics for the period 1922 to 1928, inclusive, shows the spoilage of stone fruits in transit to be largely caused by decay due to *Rhizopus* [chiefly *nigricans*] and brown rot (*Sclerotinia fructicola*) [*S. americana*: *R.A.M.*, xii, pp. 102, 228]. In a total of 7,846 cars of peaches inspected during the seven years, 2,245 showed 5 per cent. or more of the fruit to be affected by brown rot, while *R. nigricans* or other types of soft rot (including *Penicillium*, *Botrytis* [*cinerea*], and *Fusarium*) was present on 5 per cent. or more of the fruit in 670 cars. During the period under review, 766 shipments of peaches arrived in the larger markets with either brown or *Rhizopus* rot in 20 per cent. or more of the fruit, 987 with 10 to 20 per cent. infection, 1,162 with 5 to 10 per cent., and 2,504 with 1 to 5 per cent. The annual loss of peaches on the market from the common forms of decay, based on these estimates alone (which represent less than 3 per cent. of the total yearly shipments), is about $200,000, so that the aggregate loss on the markets from these sources must be enormous.

A marked correlation was found, in an investigation of the Georgia shipments, to exist between heavy rainfall, such as marked the year 1928, and the incidence of brown rot, which caused over

20 times as much decay of peaches in that year as in the dry season of 1925. *Rhizopus* on the other hand, is practically unaffected by weather conditions, its occurrence in transit being almost entirely determined by picking, packing, and shipping factors. In 1925 nearly one-third more of the cars inspected showed this rot than in 1928.

The relation of temperature to the development of rot during the usual marketing period is discussed. One day at 75° F. is practically equivalent to 3 at 50°, 7 at 41°, or 25 at 32°. The brown rot fungus does not thrive at a temperature of 90° or above. *R. nigricans* gains as firm a hold in one day at 85° as in 3 at 59° or in 10 at 50°, the last-named temperature, in fact, being almost sufficient to prevent the development of this organism.

In refrigerated cars loaded with peaches in crates the inspection reports show 7·8 times as much brown rot and 15·6 times as much *Rhizopus* rot in the fourth or top as in the first or bottom layer, while in cars loaded with baskets there was 4·8 times as much brown rot and 5·4 times as much *Rhizopus* rot in the third or top as in the first or bottom layer. It was shown by test shipments with peaches in crates that during a journey of 3½ to 4½ days, the temperature at the top of the load averaged 12·5° higher than that at the bottom. The fruit at the top took about eight times as long to reach a temperature of 59° and five times as long to reach 50° as that at the bottom.

Four methods of reducing the excessive spoilage at the tops of cars are discussed. *Rhizopus* rot can be practically eliminated as a factor in spoilage and the development of brown rot considerably retarded by precooling the fruit to a temperature of 50°. Various types of blowers have been devised to reverse and intensify the air movement in the car by forcing the cold air up through the bunkers and out over the top of the load. Four to six hours of operation are usually necessary for satisfactory results by this process. The addition of salt to the ice (2 to 4 per cent. of the weight of the latter) in the bunkers greatly assists in checking the rots and retarding the softening of the fruit. A full account of the experiments with solid carbon dioxide has already been noticed [loc. cit.].

Esau (P.) & Cruess (W. V.). **Yeasts causing 'souring' of dried Prunes and Dates.**—*Fruit Products Journ.*, xii, 5, pp. 144–147, 1933.

Considerable losses are stated to be caused in California by the 'souring' of dried prunes in storage and in the final package, as well as by that of fresh dates after packing [*R.A.M.*, xi, p. 384; cf. also x, p. 679].

Six strains of, apparently, Torulaceae, and one species of *Mycoderma* were isolated from prunes that had soured in commercial storage, while fresh dates in a similar condition yielded a strain of *Saccharomyces ellipsoideus* and a species of *Torula* [cf. ibid., xi, p. 572]. The alcohol-forming power of all the yeasts except *S. ellipsoideus* was found to be relatively low. With one exception the prune yeasts failed to grow in prune pulp of 24 per cent. moisture content or less, and all produced a 'soured prune' odour

in liquid media in contrast to the smell of wine characterizing the date *Torula*.

The prevention of prune souring evidently lies in drying the fruit below the moisture content requisite for yeast growth (22 per cent. in one case). The occurrence of a similar condition in dates may be obviated by pasteurization of the fruit in sealed containers at a temperature and for a time sufficient to bring the fruit to 60° C. or above. The flavour of dates appears, from previous laboratory experiments, to be seriously impaired by temperatures at or near the boiling point of water but not by those below 65°.

The biochemical characters of the yeasts are tabulated. Most of those isolated from prunes utilized tartaric acid and grew better on succinic than on malic acid. The average dimensions of the *Torula* strains from prunes ranged from 3·5 to 6·8 by 3 to 5·1 μ, those of the *Mycoderma* being 7 by 4·5 μ. The date *Torula* measured 5·1 by 5·1 μ and utilized sucrose, levulose, maltose, lactose, glucose (gas and acid formation), galactose (acid), mannose, mannite, salicin, and xylose.

Du Plessis (S. J.). **Spraying experiments for the control of the anthracnose disease of Almonds.**—*South Africa Dept. of Agric. Bull.* 116, 9 pp., 1 graph, 1932.

Details are given of experiments conducted in 1931 at Stellenbosch, Cape Province, to determine the relative efficacy of commercial and home-made Bordeaux mixture, lime-sulphur, copper-lime dust, vomasol S, and vomasol C [*R.A.M.*, xi, p. 650] in the control of anthracnose of almonds (*Gloeosporium amygdalinum*) [ibid., xi, p. 249]. The trees selected for treatment were 8-year old ones of the Papershell, Jordan, Nil Melior, and I.X.L. varieties growing in red loam with a clay subsoil. The dormant treatments (Bordeaux mixture 4–4–50, lime-sulphur 1 in 15, vomasol S 1 in 300, vomasol C 1 in 400, and copper-lime dust $\frac{3}{8}$ lb. per tree) were given on 8th July, and the three spring applications (Bordeaux mixture 4–4–100, lime-sulphur 1 in 100, vomasol S and C 1 in 400 and 1 in 800, respectively, and copper-lime dust $\frac{1}{2}$ lb. per tree) on 12th and 28th August and 11th September. The sprays were applied by an ordinary power-spray pump at a pressure of 400 lb. per sq. in., and the dust with a vineyard sulphur duster.

Bordeaux mixture proved to be the most efficient of the fungicides tested, the full schedule increasing the yield by 474 to 882 per cent. over that of the controls, while one winter and two summer applications gave an increase of 103 to 356 per cent. and one winter and one summer treatment of 41 to 80 per cent. Copper-lime dust, lime-sulphur, and vomasol C reduced infection and proved about equally efficacious with one winter and two summer applications of Bordeaux mixture. The total cost of the Bordeaux treatments (including labour, materials, and depreciation) was £5 6*s.* 3*d.* per 100 trees, the corresponding amount for the home-made preparation (the materials for which proved much cheaper), being £2 2*s.* 3*d.* The following increased yields were obtained per 100 trees of each variety: Papershell, 392 lb. at 6*d.* per lb. = £9 16*s.* 0*d.*; Jordan, 140 lb. at 2*d.* = £1 3*s.* 4*d.*; Nil Melior, 281 lb. at 6*d.* = £7 0*s.* 6*d.*; and I.X.L., 280 lb. at 6*d.* = £7 0*s.* 0*d.*

DARROW (G. M.) & DETWILER (S. B.). **Currants and Gooseberries: their culture and relation to White Pine blister rust.**—*U. S. Dept. of Agric. Farmers' Bull.* 1398, 41 pp., 26 figs., 2 maps, 1933.

This is a revision of the writers' earlier bulletin (1024 of the Farmers' series) [*R.A.M.*, iv, p. 100] which is superseded. A. L. Quaintance contributes the section on insect pests and Louise Stanley that on ways of using the fruits, while Maude A. Thompson has compiled a summary of the more important State laws relating to the control of white pine blister rust [*Cronartium ribicola*: see below, p. 400].

LAUBERT (R.). **Ungewöhnlicher Rostbefall an zahlreichen Ribes-Arten.** [An unusual rust attack on numerous species of *Ribes*.]—*Mitt. Deutsch. Dendrol. Gesellsch., 1932*, xliv (*Jahrb.*), pp. 411–413, 1932.

Aecidium grossulariae, the aecidial stage of *Puccinia ribesii-caricis* [*R.A.M.*, xi, p. 24], developed with unusual intensity on gooseberry leaves, petioles, shoots, and fruit in the vicinity of Berlin during May and June, 1932. Among other species of *Ribes* attacked by the rust, apparently for the first time, were *R. americanum*, *R. gordonianum*, *R. nevadense*, *R. nigrum* × *petraeum*, *R. rubrum* × *multiflorum*, *R. uva crispa*, and *R. vilmorinii*. Infected bushes were observed at a very considerable distance from any of the alternate hosts (*Carex* spp.) the sporidia from which must, therefore, be blown a long way by the wind.

DEL CAÑIZO (J.) & SARDIÑA (J. R.). **La enfermedad de la Platanera en el Valle de la Orotava.** [The Banana disease in the Orotava Valley.]—*Bol. Pat. Veg. y Ent. Agríc.*, vi (*1931*), 23–26, pp. 1–34, 14 figs., 1932.

The Panama disease of bananas is stated to have been first reported in the Orotava Valley, Teneriffe, in September, 1925, the causal organism being recently identified by Dr. H. W. Wollenweber as *Fusarium oxysporum* f. 3 [syn. *F. cubense*: *R.A.M.*, xi, p. 281]. In 1924, however, a fungus isolated from diseased material of *Musa cavendishii* sent to the Imperial Mycological Institute by the United Fruit Company from the Canaries had been identified, with the aid of Prof. S. F. Ashby and Dr. E. W. Brandes, as *F. cubense*. During 1927 and 1928, years of scanty rainfall, the disease declined in prevalence, to reappear with alarming intensity in 1929 and 1930.

The symptoms and etiology of the disease, and the morphological and cultural characters of the fungus are described at length, while observations are made on the conditions of banana growing in the island. Discussing the possibilities of control, the writers state that good results have been obtained by the application to the soil of lime at the rate of 2,000 to 2,500 kg. per hect. Suggestions are made for the correct proportions of fertilizers, and directions given for the eradication of infected plants, the sterilization of the soil by quicklime (1 part to 3 of soil) or formalin (60 gm. per sq. m.), and the establishment of new plantations.

WARDLAW (C. W.). **Banana diseases. V. Fusarium tip-rot of immature Cavendish fruits.**—*Trop. Agriculture,* x, 1, p. 6, 1 pl. [facing p. 5], 1933.

The author states that in addition to the diseases of bananas dealt with in the previous communications of this series [*R.A.M.*, xi, p. 464], a tip rot of immature Cavendish bananas has occasionally been found in different parts of Trinidad, most usually on very young fruits not yet containing starchy pulp. The rot [which is briefly described] is of no great economic importance, because as a rule only two or three fingers in a bunch are affected, but occasionally a whole hand may be rendered unsightly. Isolations from the decaying fruits most commonly yielded *Fusarium moniliforme* var. *subglutinans* [ibid., v, p. 617] and *F. lateritium* [ibid., xi, p. 306], usually accompanied by bacteria. Inoculation experiments during the wet season on immature Cavendish fruits gave negative results with both fungi, and this fact, taken in conjunction with the occasional occurrence of the disease in nature, suggests that penetration of the fruits by the associated fungal organisms can be effected only under the influence of some predisposing internal or external factor.

CONDIT (I. J.) & HORNE (W. T.). **A mosaic of the Fig in California.**—Abs. in *Phytopath.*, xxiii, 1, p. 7, 1933.

Figs in California are stated to suffer very generally from a mosaic-like disturbance of no apparent commercial importance. The leaves exhibit mottled areas and may be distorted, while shedding of both foliage and fruit occurs in severe cases. No insect vector of the disease has been detected. Cuttings from affected trees propagated in the greenhouse continue to show mosaic. Seedlings from diseased plants have remained healthy for about a year in the greenhouse, whereas buds from healthy seedlings set in diseased trees have grown into mosaic shoots. After several years in the orchard much mosaic is shown by seedlings. The disease under investigation appears to be a true mosaic.

GASSNER (G.) & GOEZE (G.). **Über die Wirkung einiger Pflanzenschutzmittel auf das Assimilationsverhalten von Blättern.** [On the effect of some plant protectives on the assimilatory capacity of leaves.]—*Ber. Deutsch. Bot. Gesellsch.*, l, 10, pp. 517–528, 1933.

The methods used by the writers in their studies on the effects of certain plant protectives on the assimilatory capacity of leaves were essentially similar to those employed in earlier investigations on the action of potash on wheat foliage [*R.A.M.*, xi, p. 704]. Certain adjustments, however, were made in the carbonic acid content of the assimilation chamber, the aerial velocity being changed from 8 to 5 or 6 m. per 3 l. and the number of leaves exposed to the current reduced from 8 to 6.

Dusting the leaves of v. Rümker's early Sommerdickkopf with ground sulphur or elosal [ibid., vi, p. 394; cf. also xi, p. 767] at

21·5° C., 24 to 72 hours before the determination of assimilatory capacity, did not appreciably influence the latter. On the other hand, the application of calcium cyanamide dust at the rate of 10 or 20 per cent. with 90 or 80 per cent. kaolin [ibid., x, p. 88] up to 48 hours before estimation caused a marked reduction of assimilatory activity (as much as 40 per cent. at the maximum rate and duration). No such effects were observed, however, when the treatment was given immediately before determination. Gassner and Appel have shown [ibid., vii, p. 82] that a decline in the assimilatory capacity of cereal leaves is accompanied by a corresponding reduction in the incidence of rusts [*Puccinia* spp.], and hence it may be supposed that the efficacy of calcium cyanamide against these diseases is correlated with its depressing action on this function. In spraying experiments with 1 per cent. nosprasit [ibid., xii, p. 31 *et passim*], Bordeaux mixture, copper sulphate, and copper chloride, the reduction of assimilation was greatly enhanced by the removal of the wax layer from the leaves; this effect, combined with marked injury to the foliage, was particularly noticeable in the case of copper chloride. No effect on the assimilatory capacity of wheat seedlings raised from seed-grain immersed for an hour in 0·25 per cent. uspulun or germisan could be detected in tests on the first leaf. On the other hand, seedlings grown in sand treated with mercuric chloride at concentrations of 1 in 1,200,000, 1 in 400,000, and 1 in 120,000 showed a pronounced decline of assimilatory energy proportional to the amounts of the fungicide employed. In garden soil a corresponding effect was observed only at the maximum strength of 1 in 120,000. None of the affected seedlings showed any external sign of injury.

ROLDAN (E. F.). **Four new diseases of Philippine economic plants caused by species of the family Pythiaceae.**—*Philipp. Agric.*, xxi, 8, pp. 541–546, 4 figs., 1933.

Sweet Cayenne pineapple plants in Laguna, Philippine Islands, are liable to a wilt disease caused by a species of *Phytophthora* [*R.A.M.*, xii, p. 303] which may affect up to 20 per cent. of the stand. Diseased plants turn yellow and may either collapse suddenly or show persistent symptoms of wilting; recovery has not been known to occur. The site of infection at the stem base is strongly discoloured with irregularly zonate water-soaked areas.

A species of *Pythium* with smooth, globose or subglobose oospores is responsible for a virulent disease of abacá (*Musa textilis*) seedlings, causing damping-off of the roots, sometimes accompanied by leaf blight in the form of water-soaked blotches.

Avocado seedlings are also subject to infection by a species of *Pythium* with similar spores to the foregoing. The leaves droop, roll up gradually, and lose their green colour; in advanced stages the stem base may be shrunken and dark brown, and the rootlets decayed, soft, and flaccid.

Benguet and Chinese pine seedlings (*Pinus insularis* and *P. massoniana*, respectively) showed a water-soaked, shrunken, soft rot of the stem bases resulting in damping-off. The causal organism was found to be a species of *Pythium*, probably *P. de Baryanum*.

Moore (Elizabeth J.). **The use of phenosafranin for staining fungi on culture media or in host tissue.**—*Science*, N.S., lxxvii, 1984, pp. 23–24, 1933.

Phenosafranin has been found very useful in the study of bacterial and fungal colonies growing on an agar medium and also as a differential stain for hyphae in plant tissues. A solution is made up as follows: 20 gm. each of carbolic acid crystals, lactic acid syrup, and distilled water, 40 gm. glycerine, and 0·5 gm. or less phenosafranin. The stain is intensified by mordanting fixed sections for two hours with a 2 per cent. iron alum solution, while destaining may be effected by washing the material in a solution of 0·5 per cent. alum and 0·5 per cent. hydrochloride or in alcohol. After destaining a 1 per cent. ammonium hydroxide solution may be applied for setting or intensification. Destaining is superfluous for cultures on an agar medium, which absorbs the stain less readily than the cells.

Phenosafranin is superior to cotton blue except for hyphae in woody tissues, the lignified walls of which retain the stain as well as the hyphae.

Thom (C.) & Raper (K. B.). **The arsenic fungi of Gosio.**—*Science*, N.S., lxxvi, 1980, pp. 548–550, 1932.

To determine the capacity of some moulds to produce toxic arsenical compounds from media containing arsenic [*R.A.M.*, viii, p. 573], 0·1 and 0·15 per cent. of arsenious oxide were added to Czapek's solution agar on which the mould was grown. All of the 15 species of *Penicillium* tested gave negative results, with the possible exception of a feeble reaction from *P. duclauxi*, while two out of 22 species of *Aspergillus*, viz., *A. fischeri* and *A. sydowi* gave an active response, and traces of arsenical gas were produced by *A. fumigatus*, a species allied to *A. glaucus*, and two of the *A. ochraceus* group. The writers' strains of the other genera reported active by Gosio (*Riv. d'Igiène e Sanita Pubblica*, iii, pp. 201, 261, 1892) and Huss (*Zeitschr. für Hyg. und Infektionskrankh.*, lxxvi, p. 361, 1914) proved negative. In subsequent tests ten strains of *Scopulariopsis* of the *P. brevicaule* type [ibid., xi, p. 6] and 14 strains of *A. sydowi* were all active producers of arsenical gas. Both these groups are common in soil and many other substances.

A number of common fungi grew well on the arsenical substrata without producing gas.

Studies were also conducted on Durham coarse sandy loam samples from areas in South Carolina previously reported by W. R. Albert and W. R. Paden (*Science*, N.S., lxxiii, p. 622, 1931) to contain enough arsenic to prevent the normal growth of certain crops. The most abundant moulds were two species of *Fusarium* and a few sterile forms producing brown to black mycelial masses. Gas containing arsenic was actively produced in arsenic agar cultures by the two species of *Fusarium*, one sterile brown fungus, and one strain of *Paecilomyces*.

The fungi under discussion do not appear to be exacting as to the form of arsenic presented, various commercial 'arsenicals' and products to which arsenic compounds were applied as preservatives

having been successfully utilized. This fact is of interest in relation to the use of copper and zinc arsenites in timber preservation [ibid., vii, p. 484; see also xi, p. 84].

The arsenic fungi are evidently more numerous than was formerly supposed and include some common soil saprophytes. Arsenical substances conveyed to the soil come into contact with decomposing agents tending to break them into volatile or rapidly soluble forms. Arsenical accumulations in the soil, however, need only be anticipated under the influence of massive amounts or in special conditions adverse to the development of a varied microflora. In the light of these data the use of arsenical timber preservatives should be avoided in enclosed areas.

Meier (F. C.), Stevenson (J. A.), & Charles (Vera K.). **Spores in the upper air.**—Abs. in *Phytopath.*, xxiii, 1, p. 23, 1933.

Spore collections made on five aeroplane flights over the eastern United States in 1932 at altitudes ranging from 500 to 18,000 ft. indicate that certain agents of plant disease may travel long distances in a viable condition before falling to start new local infections. Above 8,000 ft. the numbers usually declined considerably, but viable *Pestalozzia* spores were collected on 22nd March 18,000 ft. above Washington in a strong west wind. Species of a number of genera [which are listed] were identified.

Hatch (A. B.) & Doak (K. D.). **Mycorrhizal and other features of the root systems of Pinus.**—*Journ. Arnold Arboretum*, xiv, 1, pp. 85–99, 4 pl., 1 fig., 1933.

An account is given of the writers' investigations on the distinctive anatomical and morphological features of the mycorrhizal and non-mycorrhizal root systems of *Pinus strobus* and *P. sylvestris* [cf. *R.A.M.*, xii, p. 183], part of the material having been studied by the senior author in Sweden, and the remainder by both at the Arnold Arboretum, Harvard University, and the Allegheny Forest Experiment Station, Philadelphia.

In ten experimental three-month-old seedlings of *P. sylvestris* examined at Stockholm, there was an average of 19 long or permanent and 474 short ephemeral roots per seedling, all of the latter, as a rule, being mycorrhizal, while the long ones are seldom associated with this type of fungus. In seedlings of *P. strobus* and *P. sylvestris* in pot cultures one of the writers observed that mycorrhizal development may occur at the tips of the long roots in the autumn, after their elongation has almost ceased. Probably the rapid elongation of the long roots is the main reason for their usual escape from mycorrhizal infection.

The short roots may be divided into three kinds, namely, uninfected, infected without mycorrhizal structure (pseudomycorrhiza), and infected with mycorrhizal structure (mycorrhiza). The first type is stated to be extremely rare, probably occurring only in pure cultures and in open, mineral solution sand cultures free from organic substances. Melin's description of the pseudomycorrhizal type [ibid., i, p. 124; iii, p. 470] applies equally well to the American material investigated. In external appearance a pseudomycorrhiza differs from an uninfected short root chiefly in its

shorter length and darker colour. The cells of the cortical region of a mycorrhizal short root of *P. strobus* grown in pure culture with *Lactarius deliciosus* [ibid., iii, p. 471] measure 43 and 40 μ in radial and longitudinal diameter, respectively, compared with 29 and 61 μ in uninfected short roots. There is thus a considerable increase in radial size (hypertrophy) as a result of infection. The diameter of the uninfected short root is 300 μ and that of the mycorrhiza (average in the case under observation) 485 μ, an increase of about 62 per cent. Judging by the very slow growth of uninfected short roots, the writers find little support for the numerous references in the literature to the cessation of root growth following invasion by mycorrhizal fungi. On the contrary, the profuse dichotomy occurring after infection is a manifestation of continued growth that is probably restricted to the mycorrhizal roots. In one mycorrhizal short root of a test seedling of *P. strobus* there were some 50 individual growing tips, while 84 were counted in another case. There was no evidence that the total length to any one of these tips was less than would have been reached by an uninfected short root.

HATCH (A. B.). **True mycorrhizal fungus in contrast to Mycelium radicis atrovirens.**—Abs. in *Phytopath.*, xxiii, 1, p. 14, 1933.

A fungus with black mycelium isolated from black mycorrhiza of *Pinus sylvestris* in Sweden formed typical ectotrophic mycorrhiza in pure culture with *P. strobus* and *P. resinosa*; it is provisionally named *Mycelium radicis nigrostrigosum*. On the other hand, mycelium of the *M. r. atrovirens* type [*R.A.M.*, vi, p. 681] isolated from the same kind of mycorrhiza on *P. sylvestris*, overgrew and killed similar pure culture seedlings. The latter fungus in aerated culture neither attacked the aerial portion of the seedlings nor formed mycorrhiza. Its optimum development apparently occurs on the surface of short roots transformed into mycorrhiza by other fungi [see preceding abstract].

NORD (F. F.) & WEIDENHAGEN (R.). **Ergebnisse der Enzymforschung. II Band.** [Results of enzyme research. Volume II.]—xii + 358 pp., 17 figs., 13 diags., 28 graphs, Leipzig, Akademische Gesellschaft M.B.H., 1933.

The following are the titles of the second series of papers on enzymatic research comprising the present volume. (1) The kinetics of enzyme reactions, by E. A. Moelwyn Hughes (English). (2) Cryolysis and its relation to the mechanism of enzymatic action, by F. F. Nord (German). (3) The stereochemical specificity of the esterases and the synthesizing action of the ester-splitting ferments, by P. Rona and R. Ammon (German). (4) The specificity of emulsin, by B. Helferich (German). (5) The experimental bases of enzymatic cane sugar cleavage, by R. Weidenhagen (German). (6) Isolation and properties of crystalline trypsin, by J. H. Northrop and M. Kunitz (English). (7) On chemical processes and on energy relations in the physiological decomposition and conversion of the carbohydrates and their cleavage products, by C. Neuberg and E. Simon (German). (8) Co-zymase, by K. Myr-

bäck (German). (9) On the energy metabolism of the yeast cell, by F. Windisch (German). (10) Glycolysis, by E. Lundsgaard (German). (11) The mechanism of dehydration, by A. Bertho (German). (12) Cytochrome and intracellular respiratory enzymes, by D. Keilin (English). (13) Peroxidase. A comparison with other iron-porphyrin catalysts in cells, by D. B. Hand (English). (14) Blood coagulation, by H. J. Fuchs (German). (15) Ferment models (organic catalysators with fermentative action), by W. Langenbeck (German). (16) The enzymatic function of mitochondria, by E. S. Horning (English).

Lüdtke (M.) & Achmed (H.). **Über einen pflanzlichen Welkstoff.** [On a substance causing wilting of plants.]—*Biochem. Zeitschr.*, cclvii, 4–6, pp. 256–266, 1933.

In the writers' culture experiments *Fusarium vasinfectum* from cotton plants, and *F. lycopersici* from tomatoes produced amine-like substances. In order to ascertain whether these were responsible for the wilting symptoms associated with the fungi in question the effects of several bases and amino-acids on tomato and summer wheat seedlings were tested. The volatile amines were found to exert a particularly strong toxic action [*R.A.M.*, xii, p. 314].

Reid (R. D.). **A study of the bactericidal, bacteriolytic or inhibitory substance produced by some moulds and some factors which influence its production.**—*Journ. of Bact.*, xxv, 1, p. 31, 1933.

This is an abstract of a paper read before the thirty-fourth Annual Meeting of the Society of American Bacteriologists, 28th to 30th December. 1932. A group of thirty moulds was studied for the presence of an inhibitory substance such as occurs, according to Fleming, in the broth filtrate of cultures of *Penicillium rubrum* [*R.A.M.*, x, p. 427]. None of the *Aspergillus* or *Mucor* spp. examined showed the capacity to produce the substance in question, which was formed, however, to a varying extent by *P. rubens, P. notatum*, and *P. chrysogenum*, as well as by *P. rubrum*, and proved toxic to *Staphylococcus aureus* and some other bacteria. The growth of *Corynebacterium diphtheriae*, for instance, was inhibited *in vitro*, but no protective action was afforded by the mould substance, nor was any local irritation produced at the site of injection in guinea-pigs. The inhibitory factor is non-dialysable through a collodion membrane and non-toxic to animals either by superficial administration or intraperitoneal injection. Heating at 60° to 90° C. is resisted by the inhibitory substance for short periods, but its active properties begin to decline after three weeks' storage at any temperature from 0° to 37·5° C. The moulds were cultivated on double strength veal infusion broth, the P_H of which was found to increase with the development of the inhibitory substance, the maximum potency of the latter being reached at P_H 8·0.

Rice (Mabel A.). **Reproduction in the Rusts.**—*Bull. Torrey Bot. Club*, lx, 1, pp. 23–54, 3 pl., 1933.

The author describes her cytological studies at Columbia University, New York City, on the aecidial stage of *Puccinia sorghi* [*P.*

maydis] from *Oxalis stricta* [*R.A.M.*, x, p. 784], *Aecidium punctatum* [ibid., ix, p. 602] from *Hepatica acutiloba*, *Puccinia violae* [ibid., v, p. 669] from *Viola cucullata*, and *Uromyces caladii* from *Arisaema triphyllum* [ibid., xi, p. 391], and discusses their significance in relation to the problems of sexual reproduction in the rusts. A review is given of some outstanding contributions to the literature on this subject.

SCHULTZ (E. S.) & RALEIGH (W. P.). **A new necrotic virus disease of Potatoes.**—Abs. in *Phytopath.*, xxiii, 1, p. 32, 1933.

A few British Queen potato plants at Eureka, California, showed a fine necrotic streaking of the leaf veins and petioles and slight streaking of the stems in 1929. The new disturbance differs from top necrosis or seedling streak in first attacking the older leaves and also in producing smaller necrotic lesions and no tuber decay. Turkish tobacco inoculated with the new virus by rubbing the leaves developed, within ten days, local pale green, afterwards white and finally brown, circular spots, but the infection did not always become systemic. Globe tomatoes and *Datura stramonium* contracted both local and systemic infection. The symptoms appeared sooner at 60° to 65° F. than at 70° to 75°. Although the manifestations of this British Queen streak on tobacco and tomato resemble those described for spotted wilt of the latter in Australia [*R.A.M.*, xii, p. 142], there is reason to suppose that the diseases are not identical.

SCHULTZ (E. S.) & RALEIGH (W. P.). **Resistance of Potato to latent mosaic.**—Abs. in *Phytopath.*, xxiii, 1, p. 32, 1933.

Inoculations with latent mosaic which is generally present in a masked form in Green Mountain and other potato varieties, failed to cause infection on certain potato seedlings, while others similarly treated became infected in every test. Under field conditions similar reactions to natural infection have been observed. Latent mosaic can cause severe necrosis in certain potato varieties and seedlings, while others are very resistant to it. The resistant seedling strains can be used to separate streak or mild, leaf rolling, or other types of mosaic from the latent form.

COCKERHAM (G.). **Variations in the total nitrogen content of normal and leaf roll Potatoes.**—*Proc. Leeds Phil. and Lit. Soc. (Scient. Sect.)*, ii, 8, pp. 375–382, 3 graphs, 1933.

After pointing out that it is evident from the literature of the subject that the presence of the potato leaf roll virus is associated with pronounced disturbances in the metabolism of nitrogenous substances in the host, the author describes an investigation into the total nitrogen content of normal and leaf roll potatoes carried out at the Scottish Plant-Breeding Station, Corstorphine, with material obtained from the same source and at the same time as that used in Barton-Wright's and M'Bain's study of the carbohydrate metabolism of normal and leaf roll potatoes [*R.A.M.*, xii, p. 48].

The results obtained [which are expressed graphically and fully discussed] showed that in the laminae of normal and leaf roll

potato plants the nitrogen content fluctuates daily, generally tending to rise during the day and fall during the night. The detailed nitrogen-time relationship was not, however, consistent in the three lots of material used. In the case of President and one set of Arran Victory, the nitrogen in the leaf roll laminae showed a marked lag in time behind that of the normal laminae, nitrogen accumulating and (presumably) being elaborated in the diseased plants later in the day. The fluctuations in the nitrogen content of the normal and leaf roll laminae of a second set of Arran Victory did not show this lag, though as in President and the first lot of Arran Victory, the evening maximum was reached later in the leaf roll laminae than in the normal.

The nitrogen contents of the normal petioles underwent similar fluctuations and followed the same general trend with time as those of the corresponding laminae, but the leaf roll petioles were anomalous in that an accumulation of nitrogen took place at night. The uneven nature of the diurnal curves showing the fluctuations in nitrogen content of the diseased plants indicated that the nitrogen exchange between leaf and petiole was continually subject to peculiarities in translocation.

The total nitrogen contents of the leaf roll laminae, as expressed by the mean diurnal values, were significantly lower than those for the normal laminae, and the ratio between the means approximated to a constant value for the three series of plants.

Tubers from the plants used in the investigation were examined just after the dormancy period had been broken in storage. Samples of the eye tissue (including small sprouts), the cortex and vascular tissue, and the medulla were taken from six tubers each of normal and leaf roll President and normal and leaf roll Arran Victory. No significant difference was noted with respect to the relative disposition of nitrogen in the three tissue groups between the normal and diseased tubers, but the actual amounts of nitrogen present in corresponding tissues were appreciably higher in the leaf roll tubers. It is considered justifiable to assume that the differences in the amount of nitrogen in normal and leaf roll laminae are chiefly due to differences in protein.

A bibliography of ten titles is appended.

DIPPENAAR (B. J.). **Environment and seed treatment in relation to common Potato scab.**—Abs. in *Phytopath.*, xxiii, 1, p. 9, 1933.

At each of five temperature stages between 13° and 25° C., inclusive, potato scab [*Actinomyces scabies*] development under controlled laboratory conditions was greatest at a soil moisture of 40 per cent. of the water-holding capacity of the soil, decreasing successively at 55, 70, and 85 per cent. Both scab and tuber development were favoured by a temperature of about 17° C. The disease was as well controlled by five or ten minutes' immersion in acidulated mercuric chloride as by the standard mercuric chloride or cold formaldehyde treatments, the first-named further being the most effective against *Rhizoctonia* [*Corticium solani*: cf. *R.A.M.*, xii, p. 110 *et passim*].

Schick (R.). **Über das Verhalten von Solanum demissum, Solanum tuberosum und ihren Bastarden gegenüber verschiedenen Herkünften von Phytophthora infestans. (Vorläufige Mitteilung zur Frage der biologischen Spezialisierung von Phytophthora infestans.)** [On the reaction of *Solanum demissum*, *Solanum tuberosum*, and their hybrids towards various strains of *Phytophthora infestans*. (Preliminary note on the problem of biologic specialization in *Phytophthora infestans*.)]—*Der Züchter*, iv, 10, pp. 233–237, 5 figs., 1932.

A tabulated account is given of the writer's inoculation experiments at Müncheberg, Mark Brandenburg, with a supposedly new physiologic form of the potato late blight fungus (*Phytophthora infestans*) from Streckenthin that had attacked (according to an oral communication) all Müller's hitherto completely resistant 'W' strains [*R.A.M.*, x, p. 545; xi, p. 667], sparing only a few hybrids of *Solanum demissum* and *S. tuberosum* and their F_2 and F_3 progeny [ibid., xii, p. 190]. Comparative tests were conducted with a local Müncheberg form of *P. infestans*. The plants were inoculated at the shoot tips with zoospore suspensions.

S. demissum proved to be immune from, and *S. tuberosum* susceptible to, both forms of the fungus; the F_1 progeny are so far immune. Some 50 per cent. of the back crosses between the F_1 generation and *S. tuberosum* were susceptible in seedling inoculation tests with the Müncheberg form, while some individuals immune from this form were susceptible to that from Streckenthin. One F_3 family consisted purely of types susceptible either to both forms or at any rate to the Streckenthin one, while in another, three types occurred, namely, susceptible to both, or only to that from Müncheberg, and resistant to both. The behaviour of the F_3 progeny indicates the probable existence of types immune from the Streckenthin physiologic form. It is at any rate apparent that there are physiologic forms of *P. infestans* characterized by a differential pathogenicity towards various hosts.

In 1927 the writer received from Dr. R. N. Salaman material of *S. etuberosum* (probably identical with *S. edinense*), which had contracted late blight in 1907 (after 20 years of complete immunity) and remained susceptible since that date. In the writer's experiments this strain proved susceptible both to the Müncheberg and Streckenthin forms, the latter, however, being much more active in sporulation on it than the former, from which *S. edinense* is practically immune in the field.

The work of breeding blight-resistant potato varieties becomes immensely complicated through the existence of physiologic specialization in the causal organism.

Blodgett (F. M.), Mader (E. O.), Burke (O. D.), & McCormack (R. B.). **Total amount of copper applied and ratio of lime to copper in Bordeaux as important factors in Potato spraying.** —Abs. in *Phytopath.*, xxiii, 1, p. 5, 1933.

The results of four years' spraying experiments [chiefly against *Phytophthora infestans*] in New York State on Rural New Yorker potatoes indicated that the total amount of copper applied is an

important factor in the increase of yields, the maximum being secured by the use of 40 to 50 or 70 to 90 lb. copper sulphate per acre per season, according to the locality, in the form of Bordeaux mixture [*R.A.M.*, viii, p. 391; xii, p. 240]. Slightly better results were consistently given by mixtures made with high magnesium lime than by those prepared with high calcium lime.

MADER (E. O.). **Effect of pressure and amounts of copper applied in spraying Potatoes.**—Abs. in *Phytopath.*, xxiii, 1, p. 22, 1933.

In a four years' series of potato spraying tests [? chiefly against *Phytophthora infestans* in New York State: see preceding abstract], when nozzles with a small orifice (1·18 mm. in diameter) were used, the amount of spray fluid applied and the yield per acre increased with each rise of pressure up to 600 lb. With larger nozzle orifices no increase in yield was secured beyond 400 lb.

RALEIGH (W. P.). **A homemade colloidal copper spray.**—Abs. in *Phytopath.*, xxiii, 1, p. 29, 1933.

An effective colloidal copper spray for the control of potato late blight [*Phytophthora infestans*] was prepared by dissolving 1 lb. copper sulphate in 2 qt. water and adding 1 pint black-strap molasses and $\frac{4}{10}$ lb. lye dissolved in 1 qt. water. The mixture was allowed to stand until it turned yellow (usually about a day at room temperature) and then applied at the rate of the equivalent of 4 lb. copper sulphate to 50 galls. water. An advantage of this preparation is the relatively thin cover produced on the foliage, thereby facilitating the reading of mosaic percentages [*R.A.M.*, xii, p. 240].

RALEIGH (W. P.). **Fungicidal efficiency of a solution of mercuric chloride and potassium iodide.**—Abs. in *Phytopath.*, xxiii, 1, pp. 28–29, 1933.

The addition of 0·25 per cent. potassium iodide to a mercuric chloride solution (1 in 1,200) was found greatly to enhance the efficacy of the latter against *Rhizoctonia* [*Corticium solani*] on potatoes [*R.A.M.*, xi, p. 671]. Used as a dip, this compound was almost equally effective with 1½ hours' immersion in a 1 in 1,000 mercuric chloride solution, and more so than three minutes' immersion in 1 in 500 mercuric chloride or a dip in the same solution with the addition of 1 per cent. hydrochloric acid.

REINMUTH (E.) & FINKENBRINK (W.). **Experimentelles zur Frage der Eisenfleckigkeit der Kartoffel.** [An experimental contribution to the problem of Potato spraing.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 1, pp. 21–28, 5 figs., 1933.

Of late years there has been a striking increase in the incidence of spraing in German potato crops, especially of the Industrie, Preussen, Juli, Erdgold, Parnassia, Seydlitz, and Jubel varieties. The condition in question may be almost indistinguishable from 'kringerigheid' [or 'internal rust spot': *R.A.M.*, x, p. 746; xii,

p. 239], but differs from heart necrosis [ibid., xi, p. 534] in the absence of external tuber symptoms.

The etiology of spraing being very obscure, though it is usually held to be associated with certain soil conditions or with disturbances of the water balance or of respiration, the writers undertook a series of pot culture tests in 1931 and 1932 at the Rostock Agricultural Experiment Station to determine the effects on the disease of manuring and of diminished tuber respiration. The pots were filled with a mixture of sandy clay (4·5 kg.) and glass sand (1·5 kg.), with which was incorporated, each in a parallel series of eight pots, 3 gm. ammonium sulphate, 3·5 gm. sodium or Chile saltpetre, 3 gm. 40 per cent. potash salt, 3 gm. superphosphate or 5 gm. basic slag, 9 gm. burnt lime, and ½ kg. sheep dung. Eight pots received a complete fertilizer and eight control pots received none.

The pots were planted in the middle of May with Erdgold and Seydlitz tubers from an infected source. Water was given to all the pots until the plants reached a height of 10 to 15 cm., when four of each series were treated with melted paraffin which, on cooling, hardened into a solid coating all round the stem bases, completely excluding air.

Respiration was found to be greatly impeded by the paraffin layer, as indicated by the extensive lenticel formation in the affected tubers. No consistent influence, however, on the development of spraing could be detected as a result of this. The addition of sheep dung to the pots appeared to promote the occurrence of spraing, but apart from this fact the outcome of the fertilizer tests [the data of which are shown in tabular form] was too conflicting to admit of any definite conclusion.

In a further test 28 diseased and 28 healthy Erdgold tubers were planted on a clay-sand soil to which a mineral fertilizer was applied. The progeny of the healthy tubers yielded 339 tubers of which 9 (2·7 per cent.) were diseased, the corresponding number from the infected lot being 269, of which 17 (6·3 per cent.) developed spraing. It is evident, therefore, that under certain conditions spraing may be carried through the seed.

TULLIS (E. C.). **Leptosphaeria salvinii, the ascigerous stage of Sclerotium oryzae.**—Abs. in *Phytopath.*, xxiii, 1, p. 35, 1933.

Leptosphaeria salvinii was found on greenhouse rice plants at Fayetteville, Arkansas, and on 16 different varieties at the Rice Branch Experiment Station in 1931. Cultures from ascospores in the following winter and spring produced sclerotia typical of *Sclerotium oryzae* and conidia characteristic of *Helminthosporium sigmoideum* [*R.A.M.*, xi, p. 469 ; xii, p. 12]. Inoculation experiments on rice with these sclerotia resulted in the production of perithecia, conidia, and sclerotia, thereby establishing the genetic connexion between the three stages.

MURRAY (R. K. S.). **Importation of Rubber budwood and budded stumps.**—*Trop. Agriculturist*, lxxx, 1, pp. 26–31, 1933.

In this report, written on the request of the Board of Management of the Rubber Research Scheme, Ceylon, the author concludes

that although there is always the possibility of the introduction of new parasitic organisms with imported *Hevea* plant material, at the present time there is no cause of special apprehension from this source in Ceylon, since most of the diseases of *Hevea* rubber known in the East occur there. He considers the regulations now in force fully adequate to cope with the possibility, and submits that any unnecessary restriction on the entry into Ceylon of high yielding budding material is greatly to be deprecated.

NORMAN (A. G.). **The natural decomposition of plant materials.** —*Science Progress, 1933*, 107, pp. 470–485, 1933.

The natural decomposition of plant materials, whether in soil or alone, is a microbiological process in which the carbonaceous constituents of the tissue are utilized by organisms for their growth and development [*R.A.M.*, xi, p. 3]. This operation is more rapidly and effectively performed by a mixed soil flora of fungi and bacteria than by any single type of organism. In a normal mixed flora decomposition, there is undoubtedly a sequence of active forms; the fungi probably predominate in the early stages by reason of their rapid development in the presence of readily available organic matter, but later they are superseded in numbers and activity by bacteria and actinomycetes.

The various constituents of plant material vary in availability, so that the extent of decomposition depends on the constitution of the substance in question. The hemicelluloses and cellulose are readily available, the former being removed early in the disintegration process, whereas lignin is almost unavailable and appears to accumulate in proportion as rotting proceeds. The elaboration of microbial tissue demands the presence of a considerable quantity of available nitrogen, which is transformed into microbial protein. Phosphate, potash, and other inorganic ions are similarly immobilized during the process of decomposition, but to a much less extent than nitrogen. The nitrogen and inorganic ions thus withdrawn from the soil are temporarily unavailable to higher plants, and thus the amount of organic matter present, and its availability, may determine the nitrogenous balance of a soil and its immediate fertility in relation to crops.

UPPAL (B. N.) & DESAI (M. K.). **Cumin powdery mildew in Bombay.**—*Bombay Dept. of Agric. Bull.* 169 of 1932, 16 pp., 4 pl., 1933.

A fully tabulated account is given of the investigations carried out from 1928 to 1932 on powdery mildew of cumin (*Cuminum cyminum*) in the Bombay Presidency [*R.A.M.*, xi, p. 282], where the crop occupies over 2,000 acres in North Gujarat. The filiform leaves of the plants are covered with a powdery, white growth, which rapidly spreads under favourable conditions to the flowers and fruits, giving them a floury appearance. Temperature is the most important factor in the development of mildew, which flourishes between 80° and 95° F., and an epidemic which may cause losses of up to 60 per cent. is likely to ensue if the maximum December temperatures fall within this range, with normal conditions following in January and February. On the other hand, if

cool weather prevails in December the disease does not assume a serious form. Precipitation is not essential to the occurrence of mildew, though it may stimulate initial infection under warm conditions.

The morphology of the causal organism, the *Oidium* stage of a species of Erysiphaceae, is described and its taxonomic position discussed. On account of its lobed haustoria and conidial characters the fungus is referred to *Erysiphe polygoni*. The minimum, optimum, and maximum temperatures for conidial germination are 16° to 18°, 20° to 22°, and 30° C., respectively. Experimental proof was obtained at Poona of the perennation of the fungus as dormant mycelium on the seed.

The disease was completely controlled by one application of sulphur (25 lb. per acre) at the flowering period, the cost of the treatment being Rs. 2.5.0 [about 3*s.* 4*d.*] and the time required 2 to 2½ hours, per acre.

DAVIS (R. L.). **Report of the Plant Breeder.**—*Rept. Porto Rico Agric. Exper. Stat., 1932*, pp. 11–17, 1 map, 2 figs., 1933.

In 1932, 88,600 cuttings of Mayaguez seventh- and eighth-year mosaic-resistant seedlings were distributed in Porto Rico [cf. *R.A.M.*, xii, p. 113], the area occupied by Mayaguez canes increasing from 500 acres in December 1931 to 1,135 acres in the April following, when Mayaguez 28, 42, and 7 occupied, respectively, 890, 134, and 66 acres. Among the imported varieties, P.O.J. 2878 both in controlled experiments and general field trials was superior to all other varieties tested in the San German Valley [see next abstract].

KUNTZ (P. R.). **Resistencia relativa al matizado de Cañas producidas en el pais comparadas con las importadas.** [The relative resistance to mosaic of native grown and imported Canes.]—*Puerto Rico Estac. Exper. Insul. Circ.* 101, 23 pp., 1 fig., 3 diags., 2 maps, 1932.

Full details are given of the writer's comparative observations in 1931 on the relative productivity and resistance to mosaic of the locally produced and imported sugar-cane varieties in Porto Rico. The results of the inspections indicated that the local varieties, P.R. 803, P.R. 807, and F.C. 916 compare very favourably with the imported both as regards yield and resistance to mosaic [*R.A.M.*, xi, p. 804]. Among the foreign canes P.O.J. 2878 proved superior in both respects to B.H. 10 (12) and S.C. 12 (4).

COSTANTIN (J.). **Essai d'une théorie expliquant le rôle des mycorhizes de la Canne.** [A suggested theory in explanation of the role of Cane mycorrhiza.]—*Comptes rendus Acad. des Sciences*, cxcvi, 5, pp. 315–318, 1933.

The writer further develops his theories regarding the part played by mycorrhiza in the prevention of degeneration in the sugar-cane at high altitudes [*R.A.M.*, vii, p. 403].

COSTANTIN (J.). **Objections à la théorie mycorhizienne.** [Objections to the mycorrhizal theory.]—*Comptes rendus Acad. des Sciences*, cxcvi, 6, pp. 378–382, 1933.

The writer discusses and refutes various objections that have been raised to his theory of mycorrhizal influence on the health of sugar-cane and other crops [see preceding abstract]. [An abridged version of these papers appears in *Comptes rendus Acad. d'Agric. de France*, xix, 6, pp. 191–196, 1933.]

UNAMUNO (L. M.). **Notás micológicas. IV. Especies nuevas o poco conocidas de hongos microscópicos del Protectorado Español de Marruecos.** [Mycological notes. IV. New or little known species of microscopic fungi of the Spanish Protectorate of Morocco.]—*Bol. Soc. Española Hist. Nat.*, xxxii, 10, pp. 495–502, 1 fig., 1932.

An annotated list is given of 31 fungi found in the Spanish Protectorate of Morocco, of which two are new to science (furnished with Latin diagnoses), and 24 reported for the first time from the region under observation.

SYDOW (H.) & MITTER (J. H.). **Fungi indici—I.** [Indian fungi—I.]—*Ann. Mycol.*, xxxi, 1–2, pp. 84–97, 1933.

One new genus (*Mitteriella*) and nine new species are included in the authors' annotated list of Indian fungi. The following records are of special interest. *Phyllactinia corylea* [*R.A.M.*, xii, p. 181] was found on jasmine leaves; *Pleospora bataanensis* and *Microdiplodia agaves* [ibid., iii, p. 305] on the foliage of *Agave americana*; *Ascochyta cycadina* on the leaves of *Cycas revoluta*; *Cercospora sissoo* Syd. n. sp. on the foliage of *Dalbergia sissoo*, causing pale yellow to greenish-grey discolorations. *Mitteriella zizyphina* Syd. n. sp. covers more or less extensive areas of the leaf surface of *Zizyphus rotundifolia* with its black or greyish-black mycelium which does not penetrate into the leaf. It is considered to be the conidial stage of some member of the Englerulaceae.

TENG (S. C.). **Fungi of Nanking. II.**—*Contrib. Biol. Lab. Sci. Soc. China*, Bot. Ser., viii, 1, pp. 5–48, 1932.

An annotated list is given of some 150 fungi recently collected in the Nanking district of China [cf. *R.A.M.*, xi, p. 545], of which the following may be mentioned. Sorghum was attacked by *Sphacelotheca cruenta* and *Cercospora sorghi*. Rice was infected by *Phoma glumarum* [ibid., i, p. 163; ii, p. 157]. *Piricularia grisea* was observed on *Eleusine indica* [ibid., ii, p. 259; viii, p. 292]. *Scolecotrichum graminis* [ibid., x, p. 10] occurred on *Phyllostachys* sp. Cotton (*Gossypium hirsutum*) showed infection by *Colletotrichum* [*Glomerella*] *gossypii* and *Pestalozzia gossypii* [ibid., xi, p. 746]. *C. nigrum* was found on chilli (*Capsicum annuum*) [ibid., xi, p. 803]. Asparagus was attacked by *Phoma asparagi*. *Phomopsis vexans* was observed on eggplants. *Cercospora cannabis* occurred on *Cannabis sativa*, *C. nicotianae* on tobacco, and *C. personata* on groundnuts. Cowpeas were infected by *Uromyces vignae* [ibid., x, p. 810]. Vines were attacked by *C. viticola*, *Monochaetia uniseta*, *Gloeosporium ampelophagum*, *Macrophoma sicula*, *Phoma viticola*, and *P. cookei*. Apples are

commonly infected in this region by *Gymnosporangium yamadae* [ibid., x, p. 71], the alternate stage of which occurs on *Juniperus chinensis*. The latter also harbours the destructive pear rust, *G. koreaense* and its elimination is imperative. Mulberries (*Morus alba*) are liable to injury by *Aecidium mori* [ibid., x, pp. 343, 566]. *Gloeosporium foliicolum* was found on *Citrus nobilis* var. *microcarpa* leaves. Loquats (*Eriobotrya japonica*) suffer damage from *Monochaetia mali*, *Ascochyta eriobotryae* [ibid., viii, p. 486], and *Sphaeropsis malorum* [*Physalospora cydoniae*]. *Cercospora kaki* was found on *Diospyros kaki* [ibid., xi, p. 795]. *Zizyphus sativa* showed infection by *Phakopsora zizyphi-vulgaris*. *Pinus massoniana*, extensively employed in reafforestation projects, suffers heavy damage from the aecidial stage of *Cronartium quercuum*, the uredo-teleuto stages of which occur on oak (*Quercus serrata*) leaves and (apparently recorded for the first time) on those of chestnut (*Castanea mollissima*). *Lophodermium pinastri* was found on *Cunninghamia lanceolata*. *Crataegus cuneata* was attacked by *Podosphaera oxyacanthae*. *Sphaerotheca humuli* var. *fuliginea* [ibid., x, p. 500] was observed on *Helianthus annuus*. *Thea oleasa* was found infected by a fungus probably identical with *Meliola camelliae* [ibid., x, p. 492]. Silkworms (*Bombyx mori*) were parasitized by *Spicaria prasina* [ibid., x, p. 188].

Teng (S. C.). **Fungi of Chekiang.**—*Contrib. Biol. Lab. Sci. Soc. China*, Bot. Ser., viii, 1, pp. 49–71, 1932.

A list is given of 148 fungi (including two new species) recently collected by the writer in the Chekiang district of China, largely from fallen wood and from the soil.

Kern (F. D.), Ciferri (R.), & Thurston (H. W.). **The rust-flora of the Dominican Republic.**—*Ann. Mycol.*, xxxi, 1–2, pp. 1–40, 1933.

Critical and taxonomic notes are given on a further 55 species of rusts (six of which are described as new) in 17 genera from the Dominican Republic [*R.A.M.*, ix, p. 745], making the total for the country 180 (all included in the present list). A host index is appended.

Chardon (C. E.). **New or interesting tropical American Dothideales. III.**—*Journ. Dept. Agric. Puerto Rico*, xvi, 2, pp. 167–192, 3 pl., 1932. [Received April, 1933.]

In this third paper of this series [*R.A.M.*, viii, p. 604] the author gives an annotated list of 44 species of Dothideales (mainly belonging to the genera *Catacauma* and *Phyllachora*) occurring in the American tropics. Over half of the species listed are described as new to science, and a Latin diagnosis is appended in each case. The notes include the hosts, localities, and in many cases critical annotations.

Blochwitz (A.). **Die Gattung Aspergillus. Neue Spezies, synonyme und Nachträge.** [The genus *Aspergillus*. New species, synonyms, and addenda.]—*Ann. Mycol.*, xxxi, 1–2, pp. 73–83, 1933.

Notes are given on a number of species of *Aspergillus* described

since the author's systematic key to the genus [*R.A.M.*, viii, p. 675]. *A. awamori* Usami (*Mycol. Centralbl.*, iv, p. 194, 1914) differs from the type *A. luchuensis* [ibid., x, p. 636] in its euglobose vesicle, branched sterigmata, and absence of aerial growth, characters which are not considered to justify the establishment of a new species. Boedijn found a similar euglobose variant of *A. luchuensis* with branched sterigmata in Sumatra, and the writer also received a specimen of this type from Saito. The morphological and physiological characters of the fungus, which occurs in 'koji', are briefly indicated.

Critical and taxonomic notes are given on a number of other alleged new species which are regarded as synonyms, and some supplementary observations on various members of the genus are made.

PALM (B. T.). **On parasitic and epiphyllous Algae. I. A Chlorochytrium on Polygonum.**—*Rev. Algol.*, vi, 3–4, pp. 337–346, 8 figs., 1932.

In 1932 *Polygonum lapathifolium* leaves in Södermanland, Sweden, were found to be infected by an endophytic alga, closely resembling and possibly identical with *Chlorochytrium rubrum*. In fixed and stained material the young unicellular alga was first observed at rest on the epidermal surface of the leaf. At this stage it measures about 10 μ in diameter and is surrounded by a cellulose membrane. Subsequently entry is affected by the passage of the whole, presumably amoeboid body (whether a zygote or an aplanospore is uncertain) through the stomatal aperture, and the alga then broadens and elongates into a ball-shaped cell which completely fills the stomatal chamber. The outer wall of the cell shows an irregular thickening, chiefly near the leaf epidermis, while on the inner wall corresponding protuberances are formed that project for a varying distance into the protoplasm of the algal cell. The alga undergoes a typical resting stage in which the resting sporangium is filled with small oil globules; the sporangial membrane shows the irregular swellings characteristic of the earlier phases. *C. rubrum* appears to dissolve the walls of the adjacent host-cells so as to form a symplast around it and produces minute galls on the leaves of its host, so that it must be regarded as a true parasite.

PALM (B. T.). **Rhodochytrium en Amérique Centrale.** [*Rhodochytrium* in Central America.]—*Rev. Algol.*, vi, 3–4, pp. 351–353, 1932.

Rhodochytrium spilanthidis, a Protococcoid alga, is known to occur in North and South America and the Dutch East Indies, where its hosts include *Ageratum, Ambrosia, Solidago, Spilanthes*, and *Asclepias* spp., and *Hibiscus sabdariffa* [*R.A.M.*, xi, p. 301]. Recently a new host has been detected in the mountains of Guatemala, 5,000 to 7,000 ft. above sea-level, namely, *Spilanthes beccabunga*, the infected plants of which assume a reddish coloration, accompanied by an abnormal elongation of the peduncles and, in cases of severe infection, of the leaves.

Beale (Helen P.). **Serologic reaction as a means of determining the concentration of Tobacco mosaic virus.**—Abs. in *Phytopath.*, xxiii, 1, p. 4, 1933.

Green leaf extracts of Turkish tobacco affected by mosaic (Johnson's No. 1 virus) [*R.A.M.*, xii, p. 119] were tested for their capacity to form precipitates when mixed with serum of rabbits hyper-immunized against homologous extracts [cf. ibid., xii, p. 314]. The concentration of active virus in each extract was independently ascertained by the number of local lesions resulting from the inoculation of *Nicotiana glutinosa* [see next abstract], according to Holmes's method [ibid., xii, p. 118]. A correlation was found to exist between the virus concentration of the various extracts and their capacity for anti-serum precipitation, suggesting that the precipitin reaction may be of value for the rapid and accurate determination of the relative strength of virus extracts.

Birkeland (J. M.). **Experiments in acquired immunity in Tobacco mosaic and spot necrosis.**—Abs. in *Phytopath.*, xxiii, 1, p. 5, 1933.

Nicotiana glutinosa plants in the writer's tests failed to develop acquired immunity as a result of inoculation with the tobacco mosaic [see preceding abstract] or spot necrosis virus. One series of plants was tested four, and another eight weeks after the initial infection. New leaves were inoculated and the number of local lesions used as a criterion of susceptibility. No significant difference was found in the number of lesions produced on the previously inoculated plants and on the controls. Similar results were given by plants inoculated with mosaic and tested with spot necrosis, and vice versa. In some cases there was apparently more secondary necrosis round the primary lesions on the already infected plants than on the controls.

Nolla (J. A. B.). **The damping-off of Tobacco and its control in Puerto Rico.**—*Journ. Dept. Agric. Puerto Rico*, xvi, 2, pp. 203–204, 1932. [Received April, 1933.]

The author briefly describes the symptoms of damping-off of tobacco seedlings in Porto Rico, caused by *Pythium de Baryanum* and *Phytophthora parasitica* var. *nicotianae* [*R.A.M.*, xi, p. 677], and discusses the various methods tested for its control, of which two applications of Bordeaux mixture (4–4–50 and 5–5–50) to the soil, one a week before sowing the seed and the second two weeks after germination, proved to be the only effective treatment so far found. It is pointed out, however, that when copper-containing fungicides are applied to the soil following a crop of tobacco seedlings, injury to the next crop results.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 5, pp. 159, 165–170, 1933.

German Republic. A Decree dated 9th November, 1932 (effective from 15th December) requires that all Indian azaleas (*Azalea indica*) [*Rhododendron indicum*] imported into Germany must be accompanied by a duly authenticated certificate vouching

for their freedom from infection by *Septoria azaleae* [*R.A.M.*, x, p. 734] and *Exobasidium azaleae* [*E. vaccinii*: ibid., viii, p. 649].

WESTPHALIA. By virtue of a Decree of 16th August, 1932 (effective until 1st October, 1942), any person suspecting the occurrence of canker (*Nectria coccinea* var. *sanguinella*) in Canadian poplars [*Populus canadensis*: ibid., x, p. 698] must report within a week to the local police. Should the existence of the fungus be confirmed by experts, immediate arrangements must be made for the removal of diseased material. For the time being the further planting of *P. canadensis* in the administrative districts of Ahaus, Beckum, Borken, Coesfeld, and Tecklenburg is prohibited.

SOUTHERN RHODESIA. Government Notice No. 462 of 5th August, 1932, prohibits the importation into Southern Rhodesia, from overseas and from other States within the continent of Africa not subscribing to the regulations of the plant exchange list, of certain trees; fresh citrus fruits and dried peel (except candied peel); elm (*Ulmus*) seeds and plants from Europe or any country in which *Graphium* [*Ceratostomella*] *ulmi* is known to occur; chestnut (*Castanea*) seeds and plants from North America or any other country in which *Endothia parasitica* is known to be present. Sugar-cane, vine, banana, cacao, tea and coffee plants, plants grown for rubber production, and citrus trees, graft wood and seeds, together with certain plant products may be imported by the Department or by special permit and under proper safeguards.

Certain neighbouring States have concluded a Convention with Southern Rhodesia for the purposes of facilitating trade in plants and plant products under adequate safeguards, and the special regulations governing imports from these countries, which are included in a Plant Exchange List, are detailed. The countries listed are the Union of South Africa, Northern Rhodesia, and the Belgian Congo.

Décret No. 49000/1932 vii–3 du Ministre royal hongrois de l'Agriculture portant règlement sur le Service hongrois pour la protection des plantes. [Decree No. 49000/1932 vii–3 of the Royal Hungarian Ministry of Agriculture for the regulation of the Hungarian Plant Protection Service.]—pp. 1–4, 1932.

This Decree issued by the Minister of Agriculture dated 18th August, 1932, effective as from 1st October, provides for the establishment of the 'Hungarian Plant Protection Service', consisting of a plant protection council composed of representatives of the relevant scientific interests, delegates of the Ministries of the Interior, Finance, and Commerce, members of institutions connected with the plant protection organization, as well as producers and manufacturers; the Plant Protection Research Institute, divided into three sections, viz., phytopathological, entomological, and phytobiochemical; the central organization for practical plant protection; and the provincial organization for the same purpose. The functions of the phytopathological section of the Research Institute will include the study of fungous diseases and their agents, the physiological disorders of cultivated plants, and the

development of control measures. These investigations will be supplemented by the work of the phytobiochemical section.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, July–September, 1932. Announcement relating to black-stem-rust quarantine (No. 38). Revised list of Barberries and Mahonias classified under black-stem-rust quarantine regulations.—pp. 52–53, 1932.

As a result of recent experimental work by the Bureau of Plant Industry, the reaction to black stem rust [*Puccinia graminis*] of a number of species and varieties of barberry has been definitely ascertained, so that they can now (15th August, 1932) be placed in their appropriate categories as immune, resistant, or susceptible [*R.A.M.*, xi, p. 352]. For the first time *Berberis aemulans*, *B. buxifolia*, *B. diversifolia*, *B. gagnepainii*, *B. nervosa*, and some others are included in the list of species sufficiently resistant for shipment under permit into the protected States; while *B. dulcis nana*, *B. japonica* (*bealei*), and *B. levis* are added to the 96 others that are classed as susceptible and may not be moved into the protected States under any circumstances. The following are immune: *B. thunbergii* and its varieties *atropurpurea*, *maximowiczii*, *minor*, *pluriflora*, and *pluriflora erecta*. The reaction of a further 19 varieties is still under investigation.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, July–September, 1932. Announcements relating to White-Pine blister-rust quarantine (No. 63). Revision of White-Pine blister-rust quarantine regulations.—pp. 53–61, 1932.

As from 1st January, 1933, Iowa, Maryland, Ohio, Virginia, and West Virginia are added to the list of States designated as infected by white-pine blister-rust (*Cronartium ribicola*) [see above, p. 381], while the District of Columbia, being surrounded by infected States, is also classed as infected though the disease has not yet been found within its limits. From these areas no 5-leaved pines or currant or gooseberry bushes (cultivated or wild) may be moved to any other State except under specified conditions. The interstate movement of *Ribes nigrum*, *R. bracteosum*, and *R. petiolare* is prohibited except between 12 [listed] States. For 5-leaved pines a Federal permit is required for shipment from an infected State and a State inspection certificate from all others. The embargo prohibiting the movement of 5-leaved pines from points east of the Missouri Valley to the Western States is removed, and the inter-State transport of currant and gooseberry plants is further simplified by the elimination of the provision requiring immersion in lime-sulphur before dispatch; this will only be necessary in future in the case of plants shipped with leaves or active buds. Full details are given of the regulations.